Detroit Water and Sewerage Department

Wastewater Master Plan

DWSD Project No. CS-1314

Suburban CSO Basins in the DWSD Service Area

Technical Memorandum
Original Date: April 11, 2002
Revision Date: May 31, 2003
Author: Tetra Tech MPS

Table of Contents

1. Objective 1

2. Scope of Work 1

3. Background 1

4. CSO Control Regulations 2

5. List of Existing Suburban CSO Basins in Wayne, Oakland and Macomb Counties 5

6. Planning Efforts for the Control of Sanitary Sewer Overflows (SSO) 5

7. Description of Existing Suburban CSO Control Facilities 6

7.1 Oakland County CSO Basins 6
7.2 Wayne County CSO Basins 15
7.3 Macomb County CSO Basins 26

8. Summary of Design and Operational Parameters for Suburban CSO Basins in the DWSD Service Area 29

9. Dewatered Flows and Solids Loading 34

10. Flushing Equipment and Flushing Volumes 36

11. Proposed CSO Control Facilities 37

12. Summary 44

13. References 45

Note: This report was written prior to the decision to abandon the regional capture tunnel between the cities of Detroit and Dearborn. Both cities are currently planning their own tunnels for CSO storage. This report makes some recommendations based upon the construction of the joint tunnel alternative. These recommendations should be re-evaluated based on their applicability to the separate tunnel alternative.

Suburban Combined Sewer Overflow (CSO) Basins in the DWSD Service Area

1. Objective

The objective of this technical memorandum is to document information on existing and proposed combined sewer overflow (CSO) basins, and other wet weather flow control facilities located in suburban communities, that dewater to the Detroit Water and Sewerage Department (DWSD) sewer system. This memorandum also summarizes the dewatered flows and solids loading for existing basins and facilities.

2. Scope of Work

The work in this task was divided into five sub-tasks:

- Identify existing and proposed suburban CSO facilities that will return stored flows and/ or residuals or otherwise modify flows to the DWSD collection system, and to identify contact persons within the suburban communities where the basins or facilities are located.
- Provide brief descriptions of the various DWSD suburban CSO facilities and summarize their design parameters.
- Prepare tables showing the annual dewatered flows, peak week volumes, and peak hour flows; annual solids load in the dewatered flow, and peak week solids for existing suburban CSO retention and treatment facilities.
- Collect information on existing or proposed plans for CSO abatement programs in the suburban communities.
- Collect information on future planning efforts for the control of sanitary sewer overflows (SSOs) and to minimize "wet" sanitary sewer problems.

This task does not include a listing of existing SSO storage facilities within the DWSD sewerage service area.

3. Background

The DWSD Wastewater Treatment Plant (WWTP), located at 9300 West Jefferson Avenue in southwest Detroit, treats sanitary and combined sewage flows from a service area of approximately 904 square miles, consisting of the City of Detroit and 76 suburban communities in Wayne, Oakland and Macomb counties.

The Greater Detroit Regional Sewer System (GDRSS) consists of four major interceptors that transport wastewater flows from the suburban communities and from within the City of Detroit, to the Detroit WWTP.

Numerous communities have typical combined sewer systems with regulators and overflow points. Regulations now require control of the combined sewer overflows.

Many of the communities that have started to implement controls have done so in the form of CSO basins to capture a certain excess flow and store it until after the storm event has passed. The construction of CSO basins has controlled some overflow points, but other overflows will be controlled in future projects. Many of the communities are investigating or have already investigated possible CSO control options. This information is also included in this report.

4. CSO Control Regulations

In 1989, the Michigan Department of Environmental Quality (MDEQ) re-issued the National Pollutant Discharge Elimination System (NPDES) permits for combined sewer overflow discharges within the Rouge River Watershed. The permit language required that all CSO flow receive "adequate treatment" before discharge to the surface waters. The NPDES permit holders contested the MDEQ's definition of "adequate treatment". Both parties accepted a settlement agreement proposed by the U.S. District Court, under the Honorable Judge Feikens. This agreement is often referred to as the "Bulkley Agreement", and outlined the design and construction of CSO treatment facilities as part of a National Demonstration Project.

The U.S. Environmental Protection Agency (EPA) issued a national policy entitled "Combined Sewer Overflow (CSO) Control Policy" in April 1994 (Final Policy 40 CFR Part 122). This policy established a consistent national policy for controlling CSO discharges to the Nation's waters through the NPDES permit program. The main purposes of this policy were to elaborate on the U.S. EPA's national CSO control strategy, published in September 1989, and to expedite compliance with requirements of the Clean Water Act (CWA).

The policy provided provisions for developing appropriate, site-specific NPDES permit requirements for all combined sewer systems that overflow during wet weather events. The policy laid out two alternative approaches – "Demonstration" and "Presumption" approaches that provided communities with CSO control targets to achieve compliance with the CWA requirements. The policy also provided enforcement initiatives for immediate elimination of overflows during dry weather and to ensure compliance with the remaining requirements of the CWA as soon as practicable.

The policy required permittees with CSOs to submit appropriate documentation demonstrating implementation of nine minimum controls. The nine controls were:

- Proper operation and regular maintenance programs for the sewer system and combined sewer overflow points.
- Maximum use of the collection system for storage.
- Review and modification of the pre-treatment program to ensure CSO impacts are minimized.
- Maximization of flow to the wastewater treatment plant for treatment.
- Prohibition of combined sewer overflows during dry weather conditions.
- Control of solids and floatable materials in the CSO.

- Pollution prevention programs that focus on contaminant-reduction activities.
- Public notification to ensure that the public receives adequate notification on CSO occurrences and their impacts.
- Monitoring and reporting to effectively characterize CSO impacts and efficiency of the CSO controls.

The permittees were also required to develop and implement long-term CSO control plans that would result in compliance with CWA requirements. The long-term plans were required to consider the site-specific nature of CSOs and evaluate cost-effectiveness of a range of control options and strategies.

Minimum requirements for the long-term CSO control plan were:

- Characterization, monitoring, and modeling of the combined sewer system.
- Public participation
- Consideration of sensitive areas
- Evaluation of alternatives - "Presumption" and "Demonstration" approaches.

A program that met any of the below criteria (no more than an average of four overflow events per year, elimination or capture for treatment of no less than 85 percent by volume of combined sewage, elimination or removal of no less than mass of pollutants identified as causing water quality impairment) would be presumed to provide an adequate level of control to meet water quality-based requirements of the CWA.
Combined sewer flows after implementation of the nine minimum controls and the first two criteria should receive a minimum of primary clarification, solids and floatables disposal, and disinfection of effluent if necessary.

A permittee could demonstrate that a selected control program, though not meeting the listed criteria for the presumptive approach, was adequate to meet the water quality-based requirements of the CWA. For a successful demonstration, the permittee has to demonstrate that: the control program was adequate to meet water quality standards (WQS) unless WQS cannot be met as a result of natural background conditions or due to pollution sources other than CSO, the planned control program will provide the maximum pollution reduction benefits reasonably attainable, the planned control program is designed to allow cost-effective expansion or retrofitting if additional controls are subsequently desired.

- Cost/ performance considerations
- Operational plan
- Maximizing treatment at the existing POTW treatment plant
- Implementation schedule
- Post-construction compliance monitoring program

The permitting authorities were required to modify the NPDES permits to implement this policy and ensure protection of water quality.

In Phase I, the NPDES permit was to be issued or modified to reflect this policy and required permittees to immediately implement at a minimum the nine minimum controls or to submit a report documenting the implementation of the nine minimum controls within two years, and to develop and submit a long-tern CSO control plan as soon as practicable.

The Phase II permit required the following:

- Implement technology-based controls including the nine minimum controls
- Implement, operate and maintain CSO controls as described in the long-tern CSO control plan
- Compliance with water quality-based effluent limits with numeric performance standards for the selected CSO controls, and other criteria.

The MDEQ published the Michigan Combined Sewer Overflow Control Program Manual in September 1996 in response to EPA's national policy on CSO control. Appendix D of the manual provided a list of items to be considered in the design of CSO control facilities. A summary of some of the important items is listed below:

- The retention/ treatment structures are to be sized based on the two theoretical design storms, ten-year, one-hour storm and the one-year, one-hour storm. The design will be governed by thirty minutes detention time for solids removal and disinfection at the ten-year storm, or retention of all flow at the one-year storm. Where "equivalent" facilities are proposed, both criteria would be considered.

- Detention time for solids removal and disinfection should be calculated based on the maximum hourly flow.

- Retention/ treatment structures are to be configured to optimize solids removal and disinfection. Compromises due to site constraints may be necessary.

- It is assumed that the retained wastewater will be discharged to the interceptor for full treatment during and following a storm event. However, dewatering a clarified and disinfected (perhaps dechlorinated) effluent to the receiving stream may be considered on a case-by-case basis.

- Dewatering rate needs to be determined on a case-by-case basis. Dewatering times of less than 48 hours will generally be desirable.

- Disinfection should be controlled to achieve less than 400 fecal coliform per 100 ml and to minimize potential aquatic toxicity

- Dechlorination will not be required unless case-specific water quality impacts are documented or expected. For example, if basin dewatering is to be to the surface waters over a prolonged period, chlorine control may be required.

5. List of Existing Suburban CSO Basins in Wayne, Oakland and Macomb Counties

Table 1 summarizes the suburban community CSO basins located within the DWSD service area, and contact persons from authorities that are responsible for the operation and maintenance of these CSO basins.

Table 1. Existing Suburban CSO Basins and Contact Persons

CSO Basin	County Location	Authority	Contact and Phone Number
Acacia Park CSO Basin	Oakland	OCDC OCDC	J. Wineka, 248-858-1901 S. Stuart, 248-858-1143
Birmingham CSO Basin	Oakland	OCDC OCDC	J. Wineka, 248-858-1901 S. Stuart, 248-858-1143
Bloomfield Village CSO Basin	Oakland	OCDC OCDC	J. Wineka, 248-858-1901 S. Stuart, 248-858-1143
GWK Drain CSO Basin	Oakland	OCDC OCDC	J. Wineka, 248-858-1901 S. Stuart, 248-858-1143
Milk River CSO Basin	Wayne	ICDB	R. Diauto, 313-884-9488
Inkster CSO Basin	Wayne	Wayne County	A. Coleman, 734-326-4643
Dearborn Heights CSO Basin	Wayne	Wayne County	A. Coleman, 734-326-4643
Redford Township CSO Basin	Wayne	Wayne County	A. Coleman, 734-326-4643
Martin CSO Basin	Macomb	SMSD	K. Cloft, 810-772-3425
Chapaton CSO Basin	Macomb	SMSD	K. Cloft, 810-772-3425

NOTES: OCDC – Oakland County Drain Commissioner
ICDB – Inter County Drainage Board (Wayne-Macomb)
SMSD – South Macomb Sanitary District

6. Planning Efforts for the Control of Sanitary Sewer Overflows (SSO)

Volume Six of this report consists of an evaluation of regional SSO controls. The evaluation includes a regional system capacity analysis, cost estimates, service contract analysis, and future growth considerations.

7. Description of Existing Suburban CSO Control Facilities

7.1 Oakland County CSO Basins

There are four CSO basins in Oakland County: Acacia Park CSO Retention Treatment Basin (RTB), Birmingham CSO RTB, Bloomfield Village CSO RTB, and the George W. Kuhn (GWK) CSO retention treatment facility (RTF) (formerly known as the Twelve Towns CSO RTF). The Acacia Park, Birmingham and Bloomfield Village CSO basins were constructed in 1997 as part of the Rouge River National Wet Weather Demonstration Project (The Rouge Project).

The Rouge Project consisted of numerous demonstration CSO retention basins constructed within the Rouge River Watershed. The intent of the demonstration basins was to show that the facilities were capable of meeting the MDEQ's requirements for adequate treatment of combined sewer overflows. The GWK Drain CSO RTF was constructed in 1971.

Acacia Park CSO RTB

The Acacia Park CSO RTB drainage area is approximately 816 acres of combined sewer system and includes parts of the Village of Beverly Hills and the City of Birmingham.

Prior to construction of the Acacia Park CSO Basin, combined sewer flows were conveyed through the Acacia Park Drain to the Evergreen Farmington Sewage Disposal System (EFSDS) interceptor at Evergreen Road, between 13-Mile Road and Saxon Road. A "tipping plate" regulator structure restricted the flow going to the EFSDS interceptor to 3 cubic feet per second (cfs). During wet weather events, the remaining flow would overflow to the Rouge River through a 72-inch diameter combined sewer overflow (CSO Outfall 1).

The Acacia Park CSO Basin and a new 10-feet diameter influent sewer were built in 1997, and the 72-inch combined sewer overflow was abandoned. The Acacia Park CSO basin is a 4.0 million gallon RTB located on Evergreen Road, north of Beverly Road. The regulator structure continues to restrict the flow going to the EFSDS interceptor to 3 cfs, with the excess flow being diverted to the RTB. The Acacia Park RTB includes settling, skimming, screening and disinfection of the combined sewer overflow. During large storm events, the RTB overflows to the Rouge River through a newly constructed effluent channel. Once the storm has subsided, the RTB is dewatered to the EFSDS.

Figure 1 is a schematic of the Acacia Park RTB.

The Acacia Park RTB has been designed to provide 30 minutes of detention for the peak hour flow resulting from a 1-year, 1-hour storm (one inch). The RTB has been designed for an effluent peak flow of 290 cfs.

The Acacia Park RTB includes an influent channel, the retention treatment basin (with two cells), effluent screens, effluent launder, effluent channel, an outfall structure, sodium hypochlorite disinfection system, a dewatering system, a flushing system, and an odor control system.

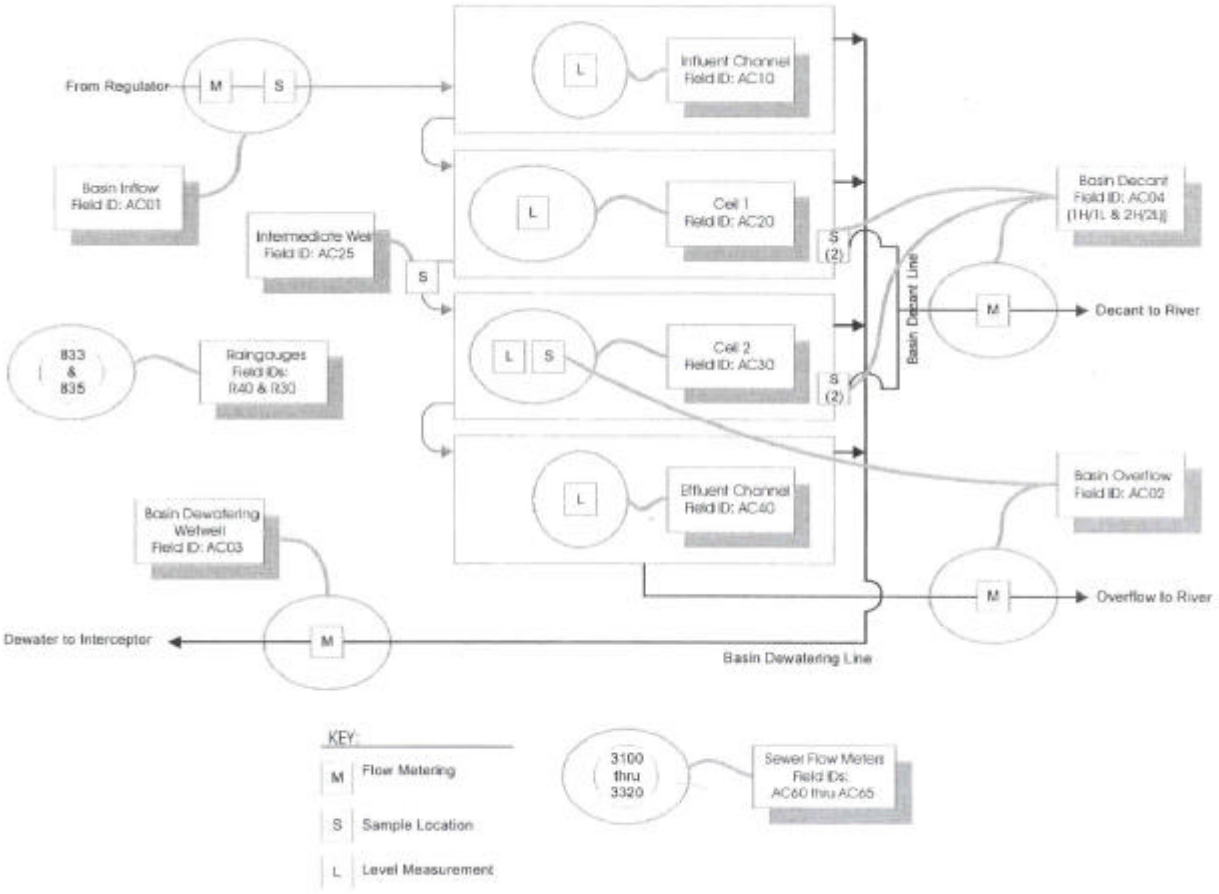

Figure 1. Acacia Park CSO RTB Flow Schematic
(Source: Retention Basin Evaluation for the Acacia Park CSO RTB, March 2000, HRC Inc.

During small storm events, overflows are collected in the RTB collector sewer and in the effluent channel without spilling into the RTB. If the level in the influent channel exceeds a certain level, the CSO overflows into cell 1, and then overflows into cell 2 after cell 1 has been filled. The disinfection system is automatically initiated when the CSO flows into cell 1. The RTB is approximately 206 ft long by 140 ft wide with an average sidewater depth of 20 ft. This provides a retention volume of 4.0 MG within the two cells. The collector sewers provide an additional 0.4 MG storage for a total storage of 4.4 MG.

The effluent screens are located directly below the effluent launder and are located in the area between cell 2 and the effluent channel. The screens are made of galvanized steel and have ¾inch openings. The screens are equipped with flushing nozzles. After a storm event has subsided, the decant pumps are used to pump decant water to these nozzles to flush back any screenings that were retained on the screens.

The effluent launder consists of a skimming baffle and multiple weir troughs. The skimming baffle prevents floating solids and debris in the CSO from being discharged to the effluent channel and in turn, to the outfall. The backwater gate structure consists of backwater gates that prevent the river water from flowing back into the effluent channel. The backwater gates open only when the water level in the effluent channel exceeds the water level in the river. The 14 ft wide by 7 ft high effluent conduit connects the backwater gate structure to the outfall structure located at the Rouge River. The outfall structure is equipped with a hinged coarse bar screen to prevent unauthorized public entry into the facility.

The sodium hypochlorite feed system consists of two 10,000-gallon storage tanks, three feed pumps, a feed tank, and two hypochlorite induction units. The sodium hypochlorite feed system is triggered when flow is detected spilling into cell 1, and the feed rate is paced based on the basin influent flow meter.

The RTB, influent and effluent channels, and the collector sewers are dewatered to the EFSDS interceptor after the runoff event has subsided. Decant water may be used to clean the effluent screens, or may be discharged to the Rouge River with MDEQ approval. The collector sewer and the influent channel are dewatered first, followed by the two RTB cells, and finally the effluent channel. During some storm events, the dewatering pumps may continue to dewater the basin during the event at a pre-determined flow rate, if the interceptor is not surcharged.

After the dewatering process, City water is used to flush the basin to remove settled solids and grit. The flushing system consists of twelve tipping buckets and associated flushing channels. The flushing water, settled solids and grit are collected in the wet well and pumped to the EFSDS interceptor.

The odor control system consists of air inlets and two low-volume exhaust fans, a chemical injection system and a contact chamber.

Birmingham CSO RTB

The Birmingham CSO RTB has a total drainage area of approximately 1,185 acres, and includes the major portion of the City of Birmingham.

The 5.5 MG Birmingham CSO RTB is located in Linden Park within the City of Birmingham. A new dewatering/ dry weather flow lift station and a new collector sewer system were also constructed along with the Birmingham RTB. The new collector sewer intercepts 33 CSO outfalls (Outfalls 001-030 and 032-034) that previously connected to the Evergreen-Farmington Sewage Disposal System (EFSDS).

The collector sewers are connected to an 11-foot diameter tunnel sewer. The tunnel sewer and the collector sewers provide an additional 4.1 MG storage to provide a total storage volume of 9.6 MG. The tunnel sewer conveys the flow to the dewatering/ dry weather pumping station where the flow is pumped into the EFSDS interceptor at the maximum rate of 4.9 cfs. Flows in excess of 4.9 cfs overflow into the Birmingham RTB.

The Birmingham RTB has been designed to provide 30 minutes detention time for runoff resulting from the 1-year, 1-hour storm (1 inch), and has been designed for an effluent peak flow of 330 cfs.

Figure 2 is a schematic of the Birmingham RTB.

The Birmingham RTB is 266 ft long, 147 ft wide, with an average sidewater depth of 20 ft. The RTB includes two cells (North Cell No. 1 and South Cell No. 2). The RTB includes an influent channel, the two cells, effluent launder (with skimming), effluent channel, backwater gates, effluent conduit, and an outfall structure to the Rouge River.

During wet weather conditions, after the storage in the collection system has filled, water flows into the tunnel riser shaft and then flows through a box conduit into the influent channel. The influent flow is by gravity. Flow from the influent channel enters Cell No. 1, and then overflows into Cell No. 2 after Cell No. 1 has been filled. Disinfection using sodium hypochlorite is automatically initiated when flow enters Cell No. 1.

The RTB effluent is screened using a galvanized steel screen ($^3/_4$" wide openings) prior to discharge into the effluent channel. Following a storm event, the decant pumps pump decant water to the effluent screen flushing nozzles to clean the screens. Two decant pumps (3,000 gpm capacity each) are provided.

The backwater gates prevent river water from entering the effluent channel. The backwater gates open only when the water elevation in the effluent is higher than the river level. Hinged, coarse bar screens are also equipped at the outfall structure to prevent unauthorized entry into the effluent channel.

The RTB, influent and effluent channels, and tunnel and collector sewers are dewatered after a runoff event. The upper, clarified portion of the RTB water can be decanted and pumped to either the effluent screen nozzles, to the interceptor, or to the backwater gate structure (with MDEQ approval). The tunnel and collector sewers, and the influent channel are dewatered before the two RTB cells are dewatered. The effluent channel is dewatered last. Two dewatering pumps, each with a capacity of 3,500 gpm, are provided. At the maximum dewatering rate of 7,000 gpm, the 5.5 MG Birmingham RTB can be dewatered in 13 hours.

After the RTB facilities have been dewatered, city water is used to flush the RTB cells to remove the settled solids and grit. The flushing system includes thirteen tipping buckets that flush the basin compartments and the influent channel.
The tipping buckets fill automatically and discharge by gravity to flush the individual channels. The basin floor is sloped so that all grit and settled solids are flushed to a channel that is then drained to the dewatering outlets and pumped to the Evergreen-Farmington Interceptor.

The odor control system includes air inlets, a chemical injection system and a contact chamber, and two low-volume exhaust fans.

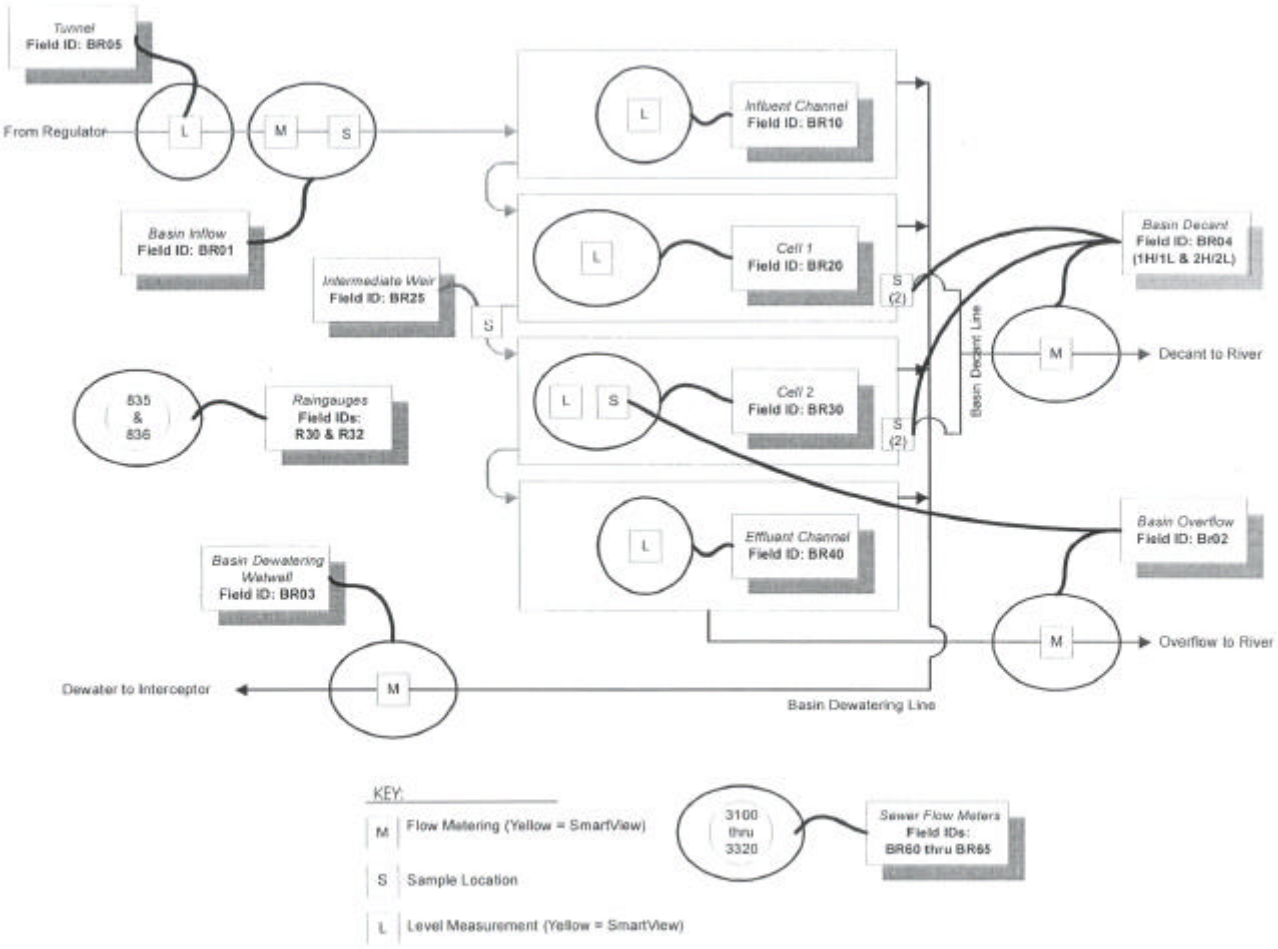

Figure 2. Birmingham CSO RTB Flow Schematic
(Source: Retention Basin Evaluation for the Birmingham CSO RTB, March 2000, HRC Inc.)

Bloomfield Village CSO RTB

The Bloomfield Village CSO RTB has a drainage area of 1,745 acres of combined sewers and 580 acres of separated sewers (total drainage area of 2,325 acres). The Bloomfield Village CSO RTB controls overflow from Outfalls 001 and 002. The Bloomfield Village RTB is on the City of Birmingham-owned Lincoln Hills Golf Course property, and located north of 14-Mile Road and west of Cranbrook Road.

A new 5 cfs "vortex" regulator structure restricts flow from the 96-inch and 66-inch diameter combined sewers to the EFSDS interceptor. Flows in excess of 5 cfs are diverted to the Bloomfield Village RTB. The Bloomfield Village RTB consists of settling, skimming, screening and disinfection of the combined sewer overflow. During large storm events when the RTB fills up, the RTB overflows to the Nichols Drain through an existing 96-inch diameter sewer, and to the Rouge River.

The Bloomfield Village RTB consists of three cells with a total volume of 10.0 MG. The collector sewers provide an additional storage volume of 0.2 MG. The RTB was designed to provide 30 minutes of detention time for the peak hour flow resulting from the 1-year, 1-hour storm (one inch). The RTB has been designed for the peak effluent flow of 700 cfs.

Figure 3 is a schematic of the Bloomfield Village RTB.

The Bloomfield Village RTB consists of an influent channel, three cells (1, 2 and 3), effluent screen, effluent launder, effluent channel, an effluent conduit, and a junction structure.

For small storm events, the overflow may be contained within the collector sewer and the influent channel. When the water level in the influent channel exceeds a certain level, it overflows into cell 1. The disinfection system is automatically initiated when the overflow starts spilling into cell 1. Cells 2 and 3 are sequentially filled only after the previous cells have been completely filled. The RTB is approximately 390 ft long, 182 ft wide, and has an average sidewater depth of 20 ft. The effluent screens are located in the area between cell 3 and the effluent channel, and are directly below the effluent launder. The screens are made of galvanized steel with openings of 3-3/4" long and ¾" wide. After a storm event, decant water is pumped to the screen flushing nozzles to back flush the retained screenings back into the RTB.

The effluent launder consists of a skimming baffle and multiple weir troughs. The overflow from the effluent launder is collected in the effluent channel and flows into a 12-foot diameter sewer, which is connected to the 8-foot diameter Nichols Drain. The Nichols Drain empties into the Rouge River.

The sodium hypochlorite disinfection feed system consists of two 10,000-gallon storage tanks, three feed pumps, one feed tank, and induction units.

The RTB cells can be decanted using the decant pumps either to the screen flushing nozzles, to the interceptor, or to the effluent sewer (with MDEQ approval). The

remaining water in the RTB cells, influent, intermediate and effluent channels, and in the collector sewers is dewatered sequentially after a runoff event has subsided. The collector sewer and the influent channel are dewatered first, followed by each RTB cell, and finally the effluent channel. During a storm event, the basins are dewatered at a pre-determined rate so long as the EFSDS interceptor is not surcharged.

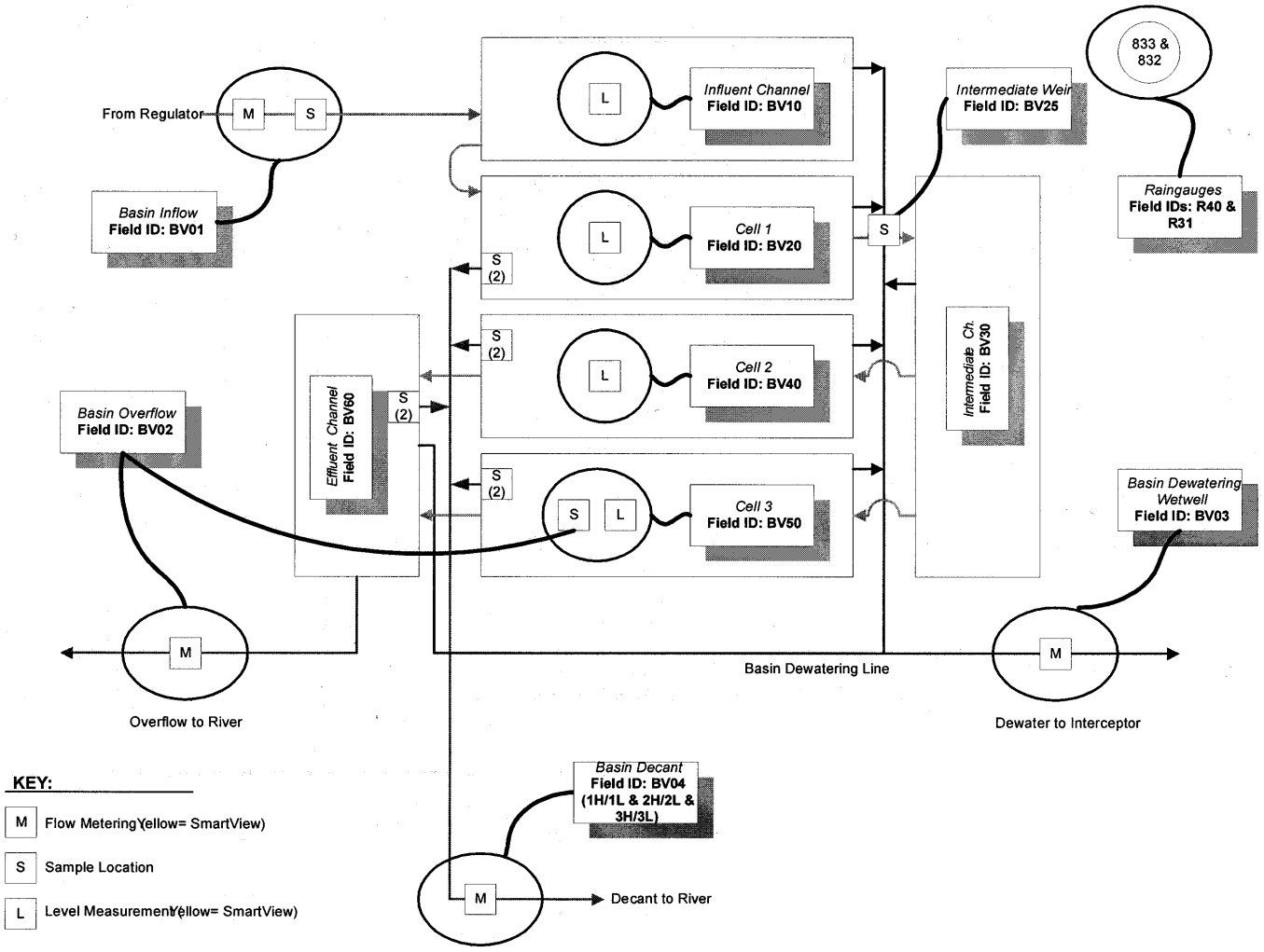

Figure 3. Bloomfield Village CSO RTB Flow Schematic
(Source: Retention Basin Evaluation for the Birmingham CSO RTB, March 2000, HRC Inc.)

The basin cells, and the influent and effluent channels are flushed after they have been dewatered. Twenty-three (23) tipping buckets along with dedicated flushing channels are provided to flush the facility. The flushing water and the settled solids and grit is collected in a wet well and pumped to the interceptor.

The odor control system consists of air inlets, four low-volume exhaust fans, a chemical injection system and a contact chamber.

The three CSO basins within the EFSDS (Acacia Park, Birmingham and Bloomfield Village CSO basins) are dewatered under a coordinated dewatering plan. Under this plan, the dewatering flow from any one of the basins may exceed individual capacity, but the total flow from the EFSDS to the DWSD collection system will not exceed the maximum discharge stipulated in the contract.

GWK Drain CSO Basin

The George W. Kuhn (GWK) Drainage District, formerly the Southeastern Oakland County Sewage Disposal System (SOCSDS) Twelve Towns Drainage District, is a combined sewer system that serves 14 communities in Oakland County and encompasses a drainage area of approximately 24,500 acres.

Until 1965, combined sewage continued to overflow unabated during rain events to the Red Run Drain, a tributary of the Clinton River in the Lake St. Clair Watershed. A 293-foot long inlet weir was constructed in 1965 that provided in-system storage of 32 million gallons (MG).

Due to increasing concern over combined sewer overflows and the promulgation of new Michigan water quality standards, a 62 MG, 2.2-mile long retention treatment facility (RTF) was constructed in 1971 to further control combined sewer overflows. The combined storage capacity including in-system storage and the RTF was 92 MG. The RTF was constructed downstream of the GWK Drainage outlet, and included 11,000-feet long double box conduits with an outside cross-section of 65 ft width by 22 ft depth.
About the same time, the SOCSDS purchased additional discharge capacity to the DWSD sewer system and increased its peak discharge flow from 118 to 260 cfs.

The RTF includes a sodium hypochlorite disinfection system with 90,000 gallons storage, a sequential flushing system over the entire length of the RTF structure, a dewatering pump station with a capacity of 90 cfs to the Dequindre interceptor, and a 950-foot long outfall weir and baffle structure for skimming. When the storage capacity in the RTF is reached, the water overflows the outfall weir and is discharged to the Red Run Drain. The RTF is authorized to discharge treated combined sewer overflow to the Red Run Drain, through a NPDES permit.

Figure 4 is schematic of the existing GWK Drain RTF, and also shows proposed improvements.

The existing inlet structure for the RTF receives flow from the north, middle and south sections of the GWK Drainage System. During dry weather conditions, the sewage flow is normally discharged by gravity to a 60-inch diameter sanitary sewer located upstream of the RTF.
Under normal conditions, the sanitary sewer will discharge approximately 50 cfs, but can discharge up to 100 cfs under surcharged conditions. The 60-inch sewer discharges to the 12-Mile Road interceptor, and eventually to the Dequindre interceptor. During wet weather periods, discharge to the sanitary sewer continues and excess flow is stored in the system until the hydraulic gradient rises to the RTF

inlet weir elevation. In addition, approximately forty-two separate storm sewers and two combined sewers from the City of Madison Heights, and a sanitary sewer from Hazel Park are directly connected to the RTF sidewalls.

The inlet weir structure includes two motorized 18-foot wide roller sluice gates, referred to as "broome gates".
The broome gates function as hydraulic relief to allow more flow to enter the RTF. Currently, the Broome gates open whenever the level over the inlet weir exceeds two feet.

Dry weather sewage flow from the GWK drainage district is discharged to the DWSD sewer system via the SOCSDS's Dequindre Road interceptor. The Dequindre interceptor serves as an outlet for the combined sewers in the GWK Drainage District and for the large separated sewer area in the Cities of Troy, Hazel Park and Madison Heights. The discharge through the Dequindre interceptor is regulated at a contractual maximum rate of 260 cfs.

A dewatering pump station, located at the end of the 2.2-mile long box conduits, is used to dewater the RTF during and after a storm event. After the RTF has been drained, retained solids are removed from the basin using a flushing system in conjunction with a motorized cleanout vehicle. All dewatered flow and flushed solids are pumped to the Dequindre Road interceptor, which discharges into the DWSD sewer system. Coarse screens, with 3" openings, are provided in the dewatering pump station to protect the pumps. The screens are manually cleaned, and the screenings are dried and hauled to a landfill for disposal.

Flushing water is supplied through a 20-inch-diameter potable water main. Potable water is used as flushing water. Three booster pumps located at the Dequindre Pumping Station facility boost the flushing water pressure. The pressure in the 20-inch supply line from the DWSD water system is approximately 65 psi, and the booster pumps raise the pressure up to 95 psi for delivery to the existing flushing nozzle system. During flushing the pressure drops to 40 psi.

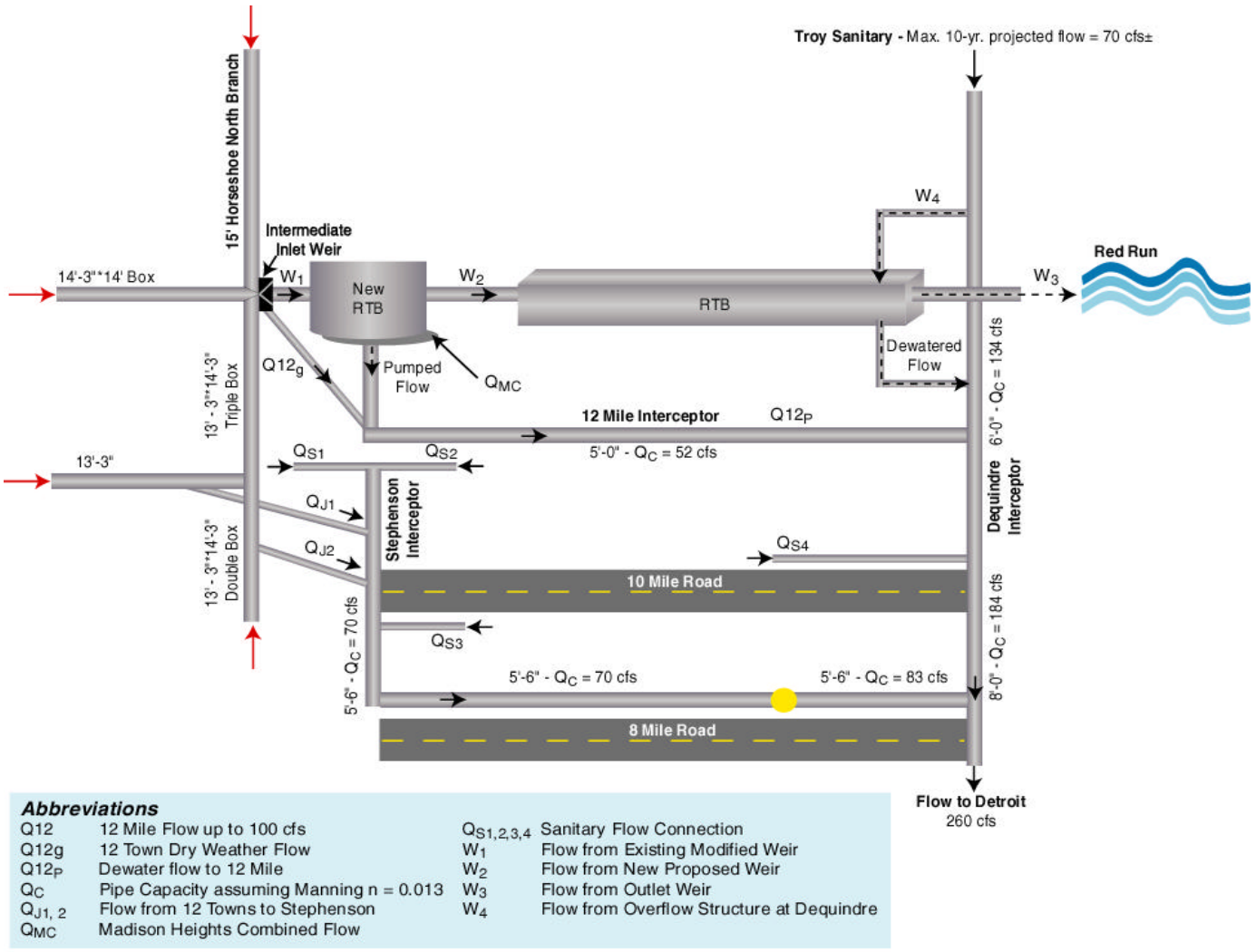

Figure 4. Existing and Proposed GWK Drain CSO RTF Flow Schematic
(Source: GWK Drainage District Improvements, April 2001, GWK Drain Team – Tetra Tech MPS)

The majority of storm events are retained by the combined RTF and in-system storage. In an average year, approximately 10 treated CSO overflows are discharged to the Red Run Drain. The smaller storm events are completely retained and dewatered to the Detroit WWTP.

The Oakland County Drain Commissioner's office collects and reports overflow data at the inlet and outlet weir for every rainfall event for which there is an overflow from the GWK Drain CSO RTF.

7.2 Wayne County CSO Basins

Excluding the three CSO retention basins within the City of Detroit limits (Hubbell-Southfield, Puritan-Fenkell and 7-Mile CSO basins), there are five CSO retention basins in Wayne County.

They are the Dearborn Heights CSO retention basin, the Inkster CSO retention basin, the Redford Township CSO retention basin, Milk River CSO retention basin (ICDB), and the River Rouge CSO basin. However, since the River Rouge CSO basin is dewatered to the Wayne County/ City of Wyandotte sewer system, it has not been discussed in this report.

The City of Dearborn Heights, City of Inkster, and Redford Township CSO basins were constructed in 1997 as part of the Rouge River National Wet Weather Demonstration Project. The Rouge Project consisted of numerous demonstration CSO retention basins constructed within the Rouge River Watershed. The intent of the demonstration basins was to show that the facilities were capable of meeting the MDEQ's requirements for adequate treatment of combined sewer overflow, before overflowing into the Rouge River. The new 19-million gallon (MG) Milk River CSO retention basin was put into operation in December 1994 to replace the previous 3.5-MG facility completed in 1960.

Redford Township CSO Basin

The Redford Township CSO retention basin serves the drainage area tributary to former CSO Outfalls U-6, U-7 and U-8. The drainage area is comprised of 669 acres of combined sewers and 1,622 acres of sanitary sewers.

The original NPDES permit required that the basin provide 30 minutes of detention time for the flow generated from the 10-year, 1-hour storm (1.7 inches of rainfall). A hydrologic and hydraulic analysis determined that the collection system could not transport the flows resulting from such a large storm. Subsequently, the basin sizing criteria was changed to 20 minutes detention of the 1-year, 1-hour storm event (1.0 inch of rainfall). The expected peak flow for the CSO basin for this storm event was determined to be 180 cfs. The Redford Township CSO basin has been designed with a storage capacity of approximately 1.7 million gallons (MG).

Figure 5 is a schematic of the Redford Township CSO basin.

The basin influent system consists of CSO regulators that deliver dry weather flow to the County interceptor, and excess wet weather flow to the CSO collector sewer. The CSO basin consists of coarse screening, influent CSO pumping, two swirl concentrators, and the retention basin.

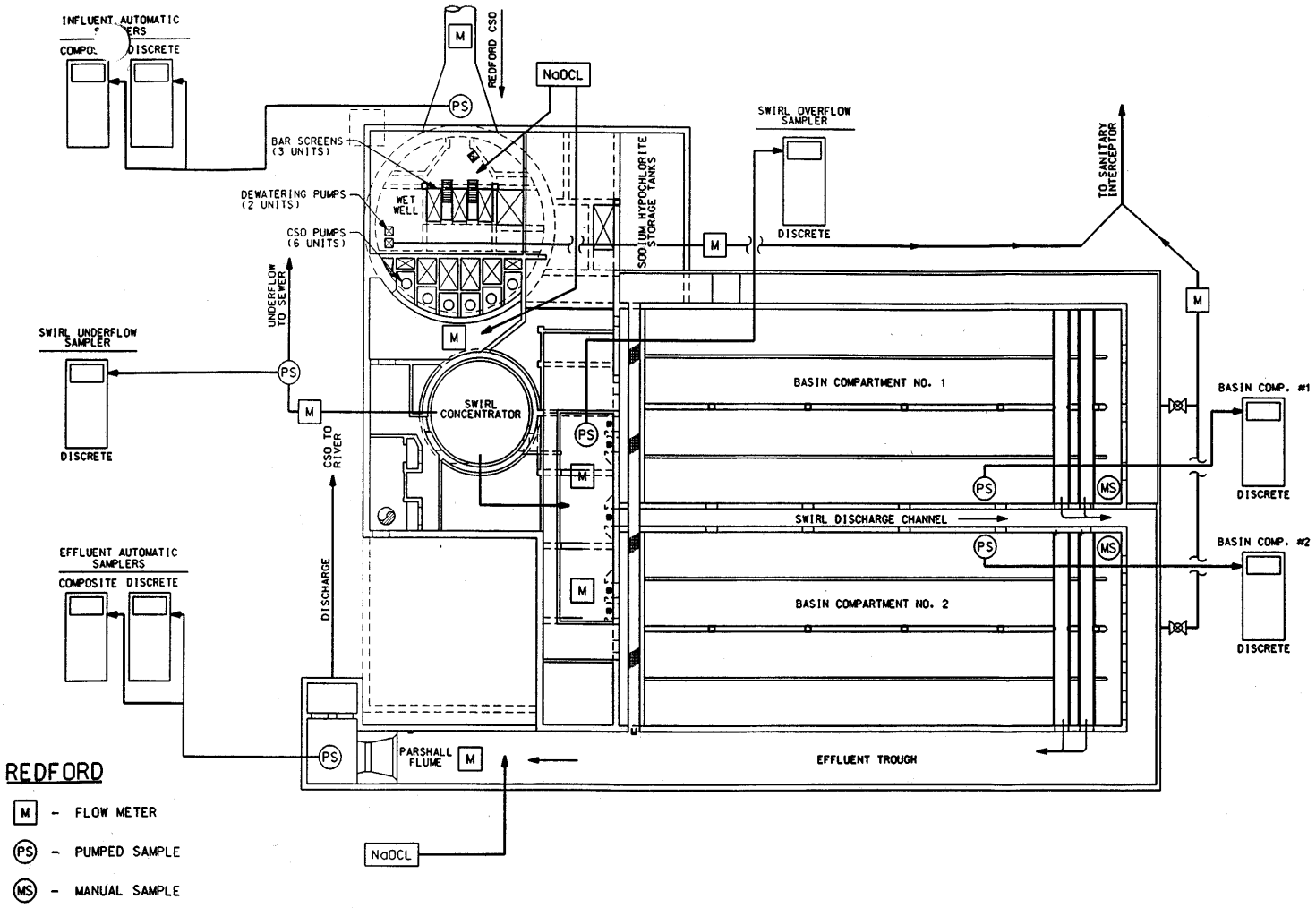

Figure 5. Redford Township CSO Basin Schematic
(Source: CSO Basin Evaluation Report – Interim Final, Redford Township Detention Basin, Redford Township, March 2000, WTA Inc.)

The three coarse screens, with 3/ 4-inch openings, are located in the wet well prior to the influent pumps. Screenings from the three bar screens are conveyed to a central dumpster from where they are transported offsite. Six influent pumps, each with a capacity of 16,200 gpm (36 cfs) at 18 ft TDH, provide a firm pumping capacity of 180 cfs. The two swirl concentrators are designed for a peak loading rate of 42 gpm/ sf when all five influent pumps are in operation. The retention basin is a below-grade structure with two compartments. Each compartment is 180 ft long, 80 ft wide, with an average sidewater depth of 8 ft. The total retention time in the two compartments at 180 cfs flow is 21 minutes. The basin is normally operated in parallel with each compartment taking half the flow but one compartment can be used as a first flush tank. Skimming is provided at the effluent end of the retention basin, and the skimmings are discharged to the sewer during dewatering.

The sodium hypochlorite disinfection system consists of two 4,000-gallon tanks, and four metering pumps. The hypochlorite solution can be added either to the pump station influent, pump station effluent, swirl concentrators, or to the basin effluent. The basin effluent flow is measured using a Parshall flume. During a large storm event, if the retention basin is filled, the basin is allowed to overflow to the Rouge River.

The basin is dewatered by gravity and is designed to empty in 12 to 18 hours after the storm event has ended. The flow is dewatered through a 12-inch line to a flow splitter chamber where it is split between two interceptors. The flow rate is controlled by the operation of modulating plug valves on each compartment. If there is sufficient local capacity within the interceptor, the basin can be dewatered during an event also.

The wet well and collector sewer are dewatered using two 500-gpm screw centrifuge type pumps located in a sump at the bottom of the wet well. Operation of the wet well dewatering pumps is automatically controlled based on the level in the wet well. The intent of the facility was to only dewater after the event, and only if there was sufficient capacity in the county interceptor. In late December 1997, operating staff at the basin requested that the wet well be dewatered throughout the event to prevent solids deposition inside the wet well.

After the basin has been dewatered, tipping buckets filled with potable water are used to flush the basin. Each tipping bucket flushes one bay from one end of the basin to a trough at the other end of the basin. Each bay is approximately 20 ft wide, with four bays within each compartment. The basin floor is sloped towards the trough and the tipping buckets are installed 10 feet above the basin floor. The tipping buckets dump approximately 100 gallons of flushing water per foot of wall width in each tip. The flushing water exits the basin through the same line as the dewatering flow.

Inkster CSO Basin

The Inkster CSO Retention Basin was constructed in 1997 and serves the drainage area tributary to former CSO Outfalls in sub-area 1 including L38, L39, L40, L48, 001, 002, 003, L44, L45 and L47. The basin serves 515 acres of combined sewers and 323 acres of sanitary sewers. The NPDES permit required that the basin be constructed to provide 20 minutes of retention time to the flow generated by the 1-year, 1-hour storm (1.0 inch of rainfall). This resulted in a basin volume of 2.0 million gallons (MG). A unique feature of the Inkster CSO Basin was the addition of a first flush compartment to hold an additional 1.0 MG, resulting in a total basin capacity of 3.0 MG. The first flush compartment was sized to retain a volume resulting from 0.05 inches of runoff over the entire drainage area.

Figure 6 is a schematic of the Inkster CSO basin.

The Inkster CSO Basin facility consists of influent screening, influent pumping, influent trough, a first flush compartment and two basin compartments, and an effluent trough.

Four bar screen units, with ¾inch clear openings, are provided upstream of the influent pumps. Retained screenings are conveyed to a dumpster from which it is transported offsite for disposal. The pump station includes six pumps, each with a capacity of 45,000 gpm (100 cfs). This provides a firm pumping capacity of 500 cfs.

The initial flow into the CSO basin during an event is diverted to the first flush compartment. The first flush compartment is not allowed to overflow to the Rouge River and can only be dewatered to the interceptor. After the first flush compartment has been filled, the other two basin compartments (2 and 3) are allowed to fill. During a large storm event, basin compartments 2 and 3 are allowed to overflow to the Rouge River. A Parshall flume in the effluent channel measures the overflow to the river. Sodium hypochlorite is used for disinfection and can be added either upstream of the bar screens, in the influent trough, or in the effluent trough.

The basin is dewatered by gravity and is designed to be emptied in 18 to 24 hours after the storm event. This will result in a dewatering flow rate of 2,780 to 2,100 gpm. The flow is dewatered through an 18-inch line to the interceptor. The flow rate is controlled by the operation of a modulating plug valve on each compartment. If there is sufficient local capacity within the interceptor, the basin can also be dewatered during an event.

The wet well and collector sewer are dewatered using two 500-gpm screw centrifuge type pumps located in a sump at the bottom of the wet well. Operation of the wet well dewatering pumps is automatically controlled based on the level in the wet well. The intent of the facility was to only dewater after the event, and only if there was sufficient capacity in the county interceptor. In December 1997, the basin operating staff requested that the wet well be dewatered throughout the event to prevent solids deposition in the wet well.

After the basin has been dewatered, it is flushed using tipping buckets. Potable water is used for cleaning and flushing purposes.

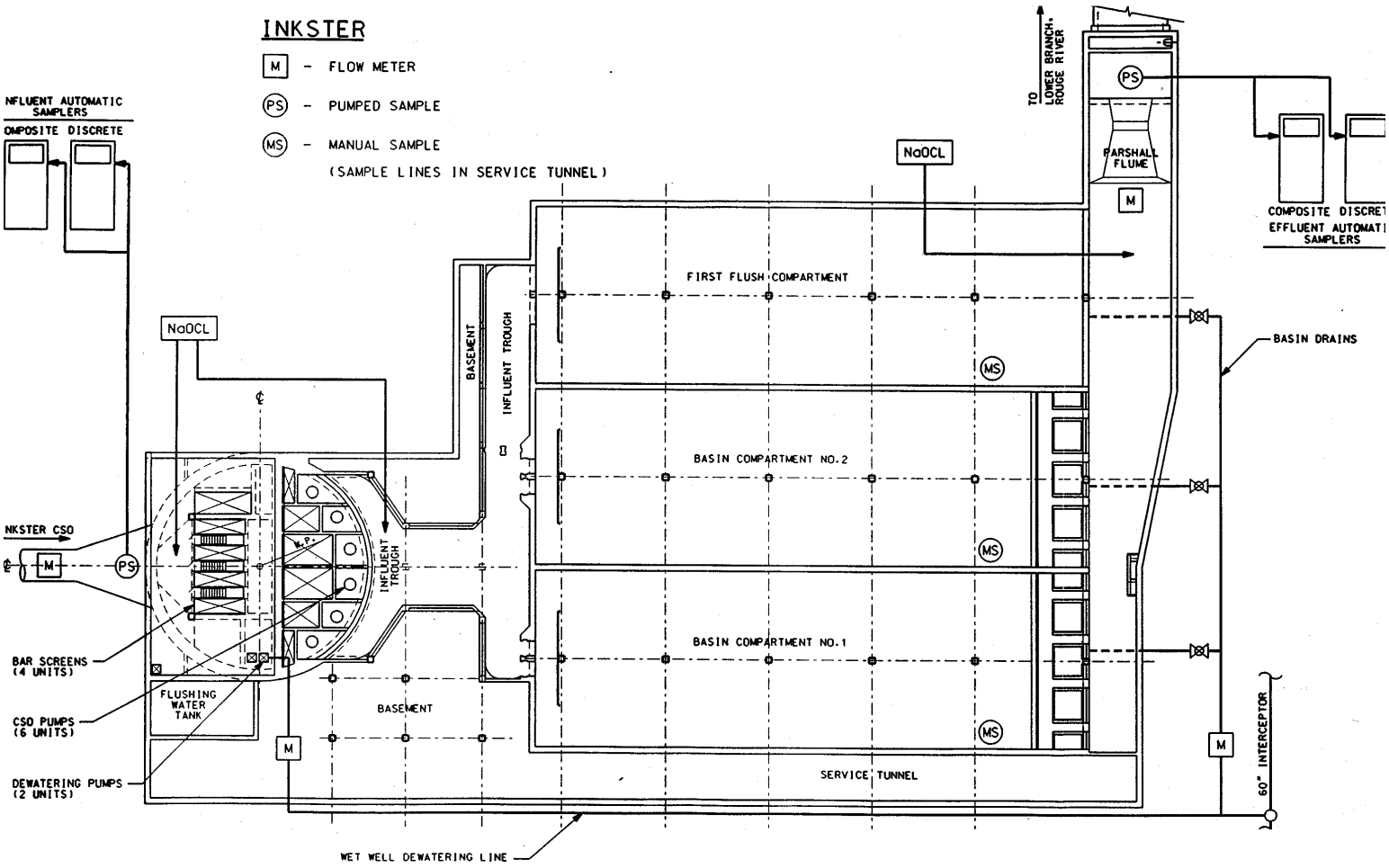

Figure 6. Inkster CSO Basin Schematic
(Source: CSO Basin Evaluation Report – Interim Final, Inkster Detention Basin, City of Inkster, March 2000, WTA Inc.)

Dearborn Heights CSO Basin

The Dearborn Heights CSO Retention Basin serves the drainage area tributary to former CSO Outfalls M-33, M-15, M-16 and M-17. The basin serves a drainage area of 320 acres of combined sewers. A hydrologic and hydraulic analysis determined that the collection system could transport flows resulting from the 10-year, 1-hour rain event. Hence, the Dearborn Heights CSO basin was designed to provide 30 minutes of detention time for flows resulting from the 10-year, 1-hour storm event (1.7 inches of rainfall). The peak flow resulting from the 10-year, 1-hour storm is expected to be 204 cfs. Correspondingly, the CSO basin volume was determined to be 2.7 million gallons (MG). However, the screening facility and the influent pump station have been designed for 500 cfs (maximum flow in the upstream sewer).

Figure 7 is a schematic of the Dearborn Heights CSO basin.

The Dearborn Heights CSO Basin facility consists of coarse bar screening, influent pumping, and the retention basin.

The screening consists of four heavy-duty catenary type bar screens with ¾inch clear openings (3/ 4-inch wide bars and 1.5-inch bar spacing). Three screens are adequate for the 500 cfs flow, with the fourth screen as a spare. Retained screenings are deposited on a conveyor that transports the screenings to a dumpster for offsite disposal. The influent pumping station has been designed for a firm capacity of 500 cfs. There are eight pumps, each with a capacity of 32,150 gpm (71.5 cfs), of which seven pumps provide the firm capacity and the eighth as a spare. The retention basin is a belowground structure with a volume of 2.7 MG. The basin is divided into three compartments (1, 2 and 3). Each compartment is approximately 177 ft long, 62 ft wide, with an average sidewater depth of 11 feet. The CSO is usually pumped to the middle compartment, No. 1. Broad crested weirs on the common walls between compartments 1 and 2, and 1 and 3 allow the CSO to first overflow to compartment 2, and then to compartment 3. When all three compartments are filled, the water overflows the main overflow weir into the effluent channel. Skimming is provided upstream of the overflow weir. The treated effluent overflow is discharged to the Rouge River.

The basin is dewatered by gravity and is designed to be emptied in 12 to 18 hours after the storm event, resulting in dewatering flows of 3,750 to 2,500 gpm. The flow is dewatered through an 18-inch line to the interceptor. The flow rate is controlled by the operation of a modulating plug valve on each compartment. If there is sufficient local capacity within the interceptor, the basin can be dewatered during an event.

The wet well and collector sewer are dewatered using two 500-gpm screw centrifuge type pumps located in a sump at the bottom of the wet well. Operation of the wet well dewatering pumps is automatically controlled based on the level in the wet well. The intent of the facility was to only dewater after the event, and only if there was sufficient capacity in the county interceptor. In December 1997, the basin operating staff requested that the wet well be dewatered throughout the event to prevent solids deposition in the wet well.

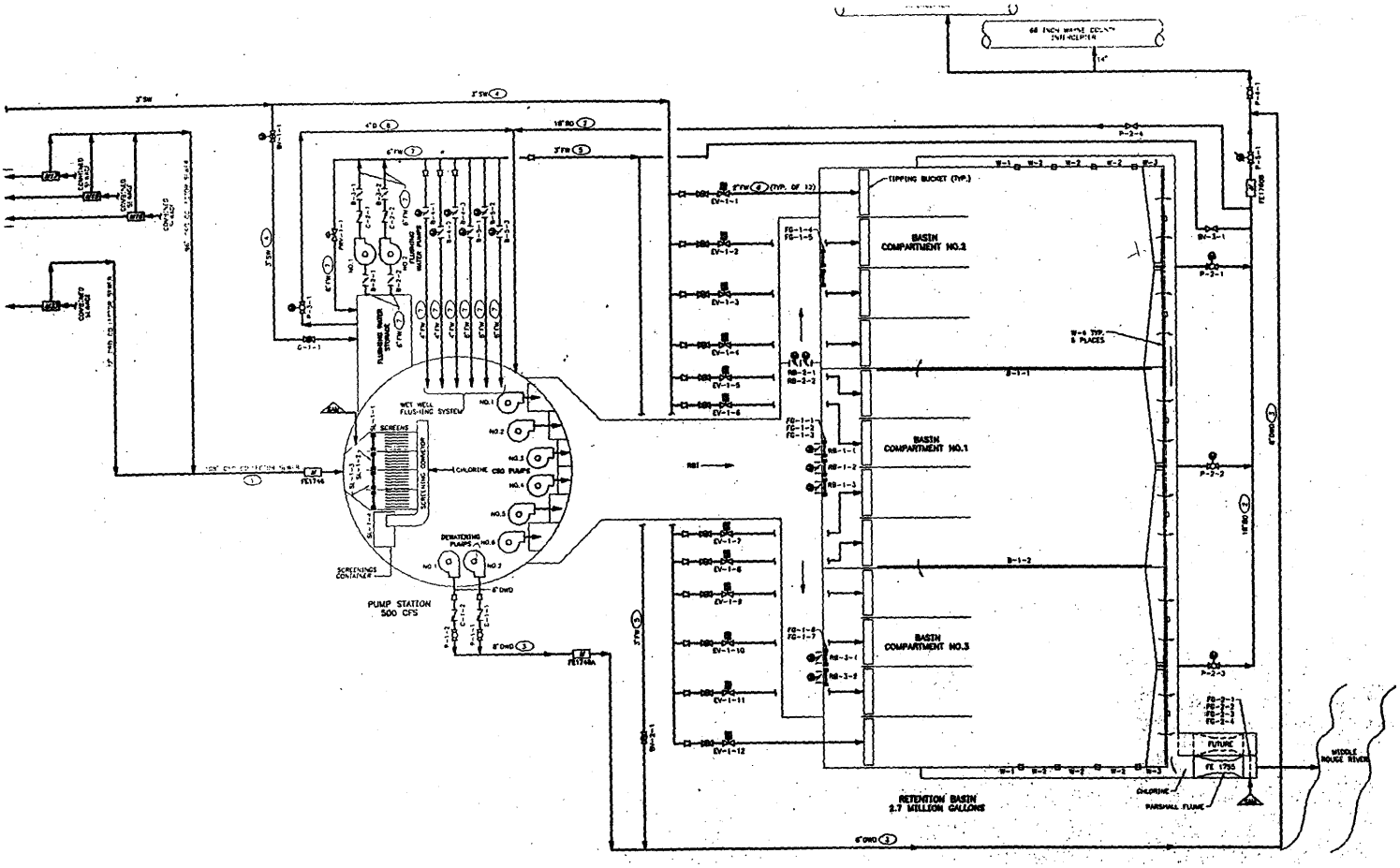

Figure 7. Dearborn Heights CSO Basin Schematic
(Source: CSO Basin Evaluation Report – Interim Final, Dearborn Heights Detention Basin, City of Dearborn Heights, March 2000, WTA Inc.)

After the basin has been dewatered, it is flushed using tipping buckets. Potable water is used for flushing. Each tipping bucket flushes a bay from one end of the basin to a trough at the other end of the basin. Each bay is approximately 20 ft wide and the tipping bucket dumps 100 gallons of flushing water per foot of wall width in each tip. The basin floor is sloped towards the trough and the tipping buckets are installed 10 feet above the basin floor. The flushing water exits the basin through the same line as the dewatering flow.

Milk River CSO Retention Basin

The existing 19 MG Milk River CSO Retention Basin facility (an ICDB facility) was put into operation in December 1994 to replace the previous 3.5-MG facility built in 1960.

The Milk River CSO basin is located south of 8-Mile Road and east of Marter Road, in Northeast Wayne County and serves the cities of Grosse Pointe Woods, Harper Woods and a small portion of St. Clair Shores. It serves a drainage area of approximately 3,700 acres.

During dry weather flow conditions, the Milk River Pumping Station (MRPS) functions as a sanitary sewage pump station. Three submersible pumps, each with a capacity of 5,000 gpm, provide a firm pumping capacity of 10,000 gpm and pump sewage from the wet well to the Grosse Pointe interceptor (GPI). During wet weather events, when the capacity of the dry weather pumps is exceeded, the water level rises in the wet well. The combined sewer overflow pumps are turned on when the wet well level reaches a certain level to prevent residential basement flooding. There are seven storm pumps – 3 pumps rated at 410 cfs each and 4 pumps rated at 275 cfs each – for a combined capacity of 2,330 cfs, and a firm capacity of 1,920 cfs.

Figure 8 is a schematic of the Milk River CSO Retention Basin.

The Milk River CSO basin has coarse bar screens, upstream of the storm pumps, with 4-inch openings. The screenings retained on the bar screens are flushed back to the sanitary sewers. The retention basin consists of two compartments. The first compartment is provided to capture the first flush. It is designed to contain flow without allowing the compartment to overflow. The first flush compartment has a storage volume of 7 MG, and was designed to contain 50 percent of the overflow events. The second compartment, with a storage volume of 12 MG, is allowed to fill after the first flush compartment has been filled. During a large storm, if both the compartments are filled, only the second compartment is allowed to overflow to the Milk River, which eventually discharges to Lake St. Clair.

Sodium hypochlorite is used for disinfection. The hypochlorite is added to the storm pump discharge when flow begins to enter the second compartment. During an overflow event, the basin effluent passes through an aeration tank where coarse bubble diffusers aerate the effluent.

From March to November each year, the Milk River water is continuously recirculated per provisions in the NPDES permit. Water is pumped from Lake St. Clair through the aeration tank located downstream of the CSO basin, and into the Milk River. Two pumps, each rated at 10,000 gpm, are used to pump the recirculation flow. A traveling screen for seaweed control located upstream of the recirculation pumps, and a sodium hypochlorite disinfection system for zebra mussel control are also provided.

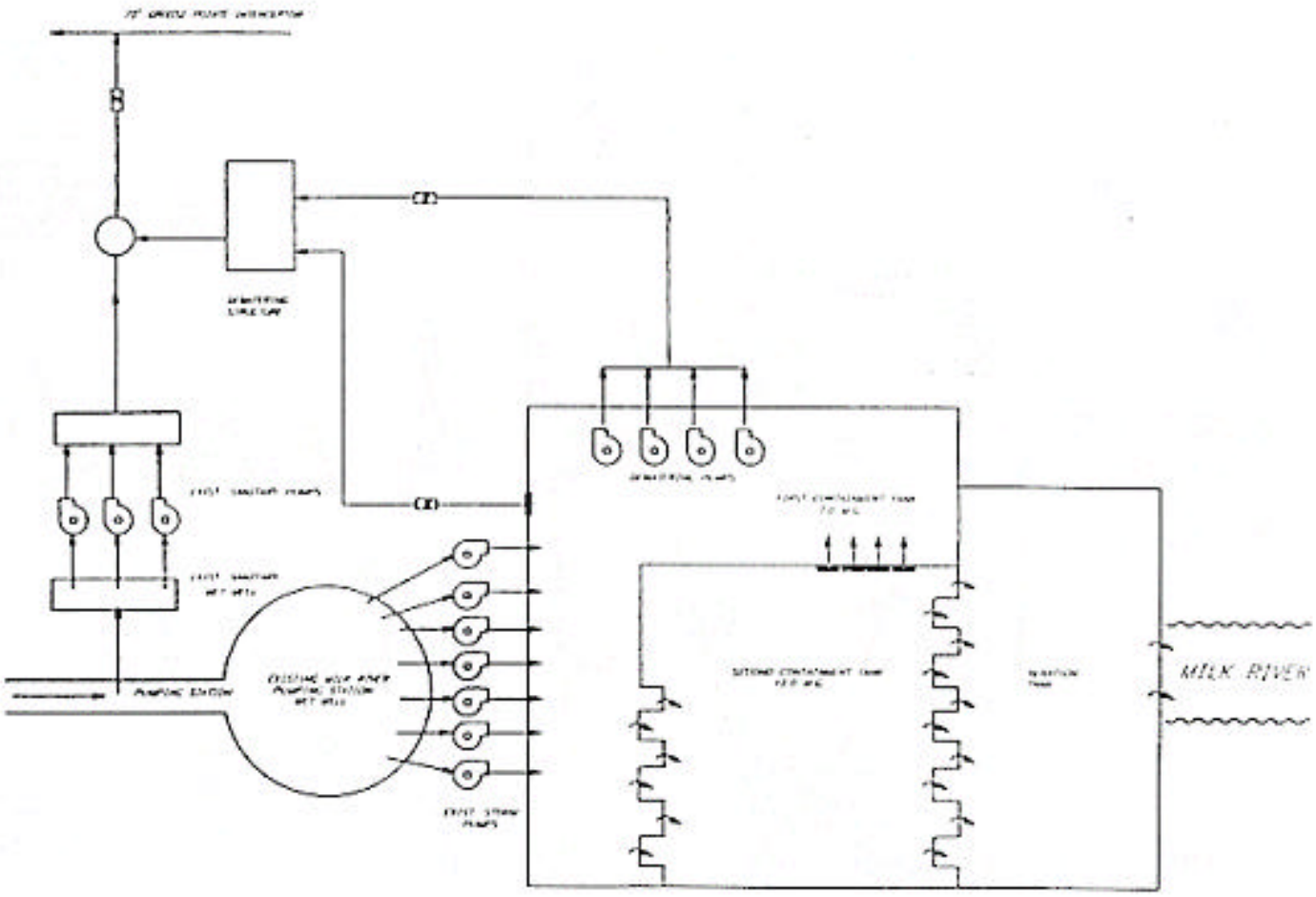

Figure 8. Milk River CSO Basin Schematic
(Source: ICDB Milk River Detention Basin – Project Performance Certification, April 1996, Tetra Tech MPS Inc.)

After the storm has subsided, the Milk River CSO basin is dewatered within five days. Dewatering is typically started within 24 hours after cessation of inflow. The start of dewatering and the dewatering rate are limited by available capacity in the interceptor. The basin is dewatered by gravity until Elevation 565.0, and is then pumped to the GPI. Four dewatering pumps, each with a capacity of 2,500 gpm, provide a firm capacity of 7,500 gpm.

The first-flush compartment receives priority in gravity dewatering and is dewatered concurrently with the second compartment during pumped dewatering operations. Combined sewer overflow into the first-flush compartment has, in general, a higher concentration of pollutant load than the overflow entering the basin later in the event.

After dewatering, solids accumulated at the basin floor are flushed using spray nozzles. The Milk River water is pumped through the nozzles.
The flushing water and the solids are also discharged to the GPI, and eventually to the Detroit WWTP for treatment.

Previously, sanitary sewage from the separated Harper Woods collection system also flowed into the Milk River pump station. A new tunnel was constructed to convey the Harper Woods sanitary flow directly to the GPI, bypassing the Milk River system. However, if the Harper Woods flow exceeds 18 cfs or if the GPI is surcharged, the Harper Woods sanitary flow is conveyed to the Milk River system. The Milk River CSO basin and collection system captures approximately 88 percent of all wet weather flows. The redirection of the Harper Woods sanitary flow has reduced the Milk River system influent pollutant load by approximately 25 percent. The Milk River CSO basin captures 85 to 90 percent of the influent pollutant load entering the facility.

7.3 Macomb County CSO Basins

The South Macomb Sanitary District (SMSD) is the only district in Macomb County that has CSO basins and is in the DWSD service area.

The SMSD service area includes the cities of Eastpointe, Roseville and St. Clair Shores, and has a total service area of approximately 15,500 acres. The SMSD service area is divided into three drainage districts: Martin district, Chapaton district and the Jefferson district. The wastewater generated within the SMSD system is discharged into Wayne County's Northeast Sewage Disposal System through the Jefferson interceptor under an agreement between SMSD and Wayne County. The agreement allows SMSD to discharge up to 102 cfs at the Marter Road pumping station.

The Jefferson drainage district is predominantly a separated sewer system and discharges directly into the Jefferson interceptor. The Jefferson district has a drainage area of 3,163 acres of sanitary sewers. The Martin drainage district has 7,217 acres of sanitary sewers and 874 acres of combined sewers. The Chapaton drainage district has 1,865 acres of sanitary sewers and 2,424 acres of combined sewers.

Martin RTB and Chapaton RTB
The SMSD includes two CSO basins. The two basins are the Chapaton RTB and the Martin RTB.
The two RTBs were constructed in 1969 to capture combined sewer overflows during wet weather events. The two CSO RTBs were designed to store the runoff resulting from the 1-year, 1-hour storm (1.0-inch of rainfall). The Martin RTB has a capacity of 8.6 million gallons and serves the Martin drainage district. The Chapaton RTB has a capacity of 28 million gallons and serves the Chapaton drainage district (areas tributary to 9-Mile sewer and $8^{1}/_{2}$-Mile relief sewer).

Figure 9 is a flow schematic of the SMSD system (including the Martin and Chapaton RTBs).

CSO entering the two RTBs receives primary treatment and disinfection. During large storm events, the two RTBs overflow to Lake St. Clair. Overflow from the two RTBs may receive secondary disinfection, if needed.

The Jefferson interceptor was constructed in 1948 to convey dry weather flow to the DWSD wastewater treatment plant. The Jefferson interceptor receives separated sewer flows from the Jefferson district, sanitary and combined sewer flows from the Martin and Chapaton districts, and dewatered flows from the two RTBs. The Beaconsfield Arm and Northeast relief sewers were constructed in the 1980s to relieve some of the wet weather flows entering the Jefferson interceptor.

The agreement between SMSD and Wayne County allows for a maximum discharge rate of 102 cfs from the Jefferson interceptor at the Marter Road pumping station. The Marter Road pumping station is a gravity station during dry weather flows and discharges to the Grosse Pointe Interceptor. During wet weather events, pumps at the Marter Road pumping station are activated to relieve surcharged conditions within the SMSD service area. The pumping station can only pump 75 to 100 cfs, which does not always prevent flooding of residential basements within the SMSD service area. Hence, a 72-inch diameter relief sewer is currently under construction to augment the 60-inch diameter Jefferson interceptor so that the SMSD can discharge up to its contract capacity of 102 cfs without flooding basements within its service area.

The Martin RTB and the Chapaton RTB are operated and maintained by the Macomb County Office of Public Works, under contract with the SMSD. Recent improvements at the two RTBs include enhanced disinfection for overflows from the basins.

Both the Martin RTB and the Chapaton RTB have no screening facilities. The two RTBs include primary treatment and disinfection within the basin and additional disinfection, if needed, for the basin overflow to Lake St. Clair. The Martin and Chapaton RTBs have a flushing/ resuspension system to dewater the basins. However, the CSO has less sand and grit than expected, and the settled solids are readily resuspended during dewatering operations. Hence, the resuspension system is rarely used at the two RTBs.

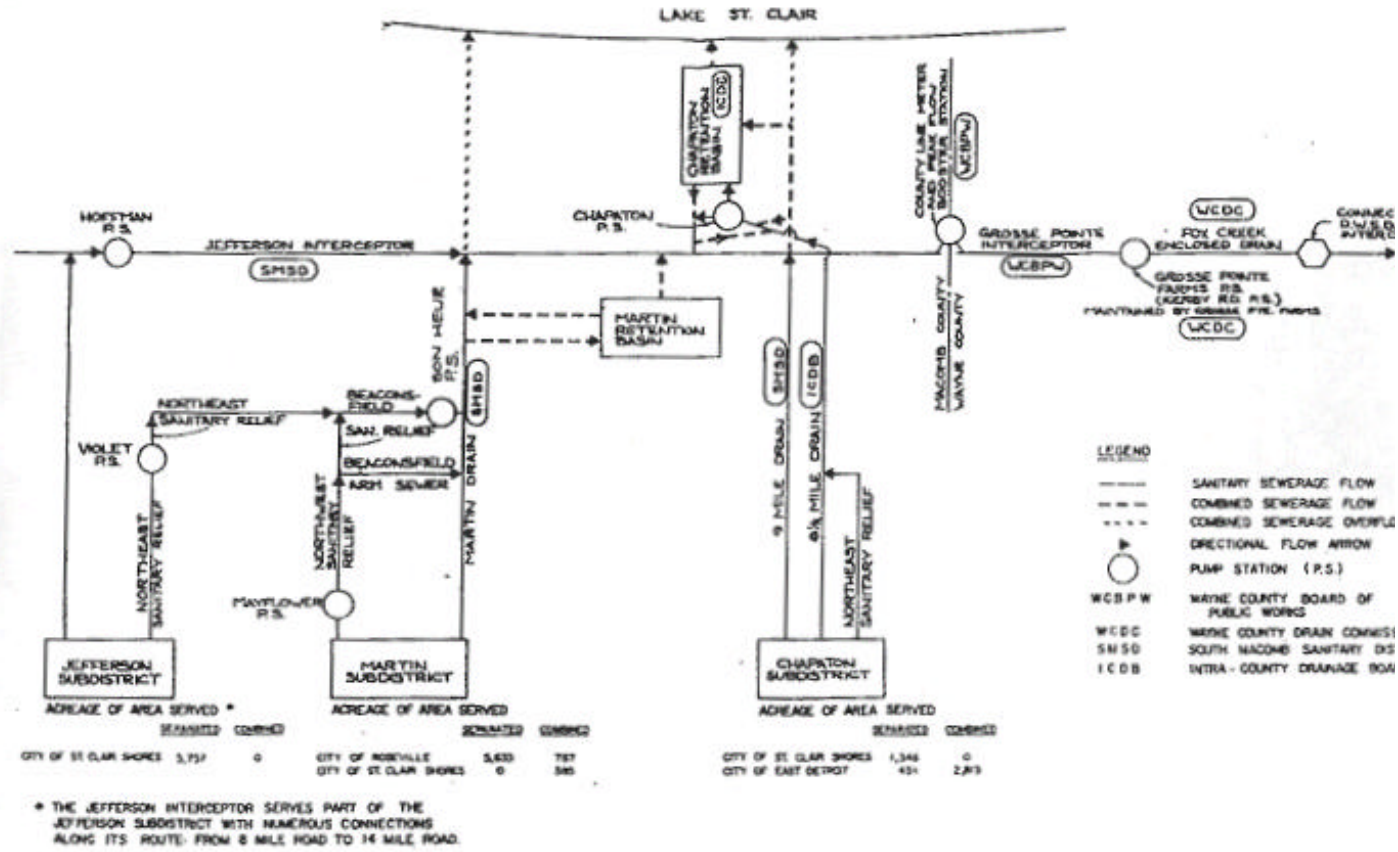

Figure 9. South Macomb Sanitary District Flow Schematic
(Source: South Macomb Sanitary District – Overflow Study and Improvement Plan, December 1996, TTMPS Inc. and SDA Inc.)

Both the Martin and Chapaton RTBs are dewatered by gravity. There are no dewatering pumps at the two RTBs. After a wet weather event, the two RTBs are dewatered within 24 to 72 hours, depending on water elevations in the Jefferson interceptor. The dewatering rate can be varied by opening more effluent gates.

The Martin RTB has a capacity of 8.6 million gallons. The influent CSO flows into the Martin RTB by gravity. The effluent is discharged either to the Lake St. Clair during overflows or to the Jefferson interceptor during dewatering. The Martin drain pump station was constructed in 1991 to eliminate the potential for the basin overflow to backup in the RTB when water level in the lake is high. However, this pump station is rarely used and the overflow flows by gravity to Lake St. Clair.

During dry weather conditions, the influent gate is closed to bypass the Martin RTB. The dry weather flow is then discharged through the Martin drain box culvert into the Jefferson interceptor through a tide gate.

During wet weather flow operation, the influent gate is opened to let the flow into the Martin RTB. If the wet weather flow is excessive and the Martin RTB is not able to store all of the wet weather flow, the Martin RTB will overflow into the Martin drain box culvert. The tide gate is closed to divert the overflow to the Martin drain pump station and to the Lake St. Clair outfall located on Rio Vista Drive.

When the Martin RTB is to be dewatered, the basin dewatering gates are opened to discharge to the Jefferson interceptor through the 42-inch Martin drain dewatering outlet.

The Chapaton RTB has a capacity of 28 million gallons and receives flow from the 9-Mile drain and the 8 1/2-Mile relief drain.

The influent CSO flow into the Chapaton RTB is pumped. The Chapaton RTB has three influent pumps, each with a capacity of 500 cfs, for a total capacity of 1,500 cfs. All three pumps are duty pumps. The overflow from the Chapaton RTB to Lake St. Clair and the dewatering flow are by gravity.

During dry weather flow conditions, flow from the two drains enters the Chapaton RTB and is discharged through the influent diversion structure to the Jefferson interceptor. During wet weather flows, the RTB is allowed to fill up. If the wet weather flow is excessive, the treated effluent from the Chapaton RTB is allowed to overflow into Lake St. Clair.

8. Summary of Design and Operational Parameters for Suburban CSO Basins in the DWSD Service Area

Tables 2 through 5 summarize the various design and operational parameters for the various suburban CSO basins located in the DWSD service area. Tables 2 through 5 describe existing conditions as of 2001.

Table 2 presents the outfalls controlled, drainage area, design storm event, and the basin retention time and basin volume for the various suburban CSO basins.

Table 2. Suburban CSO Basins – Design Parameters

CSO Basin	Outfalls Controlled	Drainage Area (acres)	Design Storm	Retention Time (min)	Basin Size (Million Gallons)
Acacia Park CSO Basin	001	816	1-year, 1-hour storm (1.0")	30	4.0
Birmingham CSO Basin	001-030, 032-034	1,185	1-year, 1-hour storm (1.0")	30	5.5
Bloomfield Village CSO Basin	001, 002	2,325	1-year, 1-hour storm (1.0")	30	10.0
GWK Drain CSO Basin	Red Run Drain	24,500	10-year, 1-hour storm (1.7")	30	62.0
Redford Township CSO Basin	U6, U7, U8	669 (comb); 1,622 (sanit)	1-year, 1-hour storm (1.0")	20	1.7
Inkster CSO Basin	L38, L39, L40, L48, 001, 002, 003, L44, L45, L47	515 (comb); 323 (sanit)	1-year, 1-hour storm (1.0")	20	3.0
Dearborn Heights CSO Basin	M15, M16, M17, M33	320	10-year, 1-hour storm (1.7")	30	2.7
Milk River CSO Basin	Milk River 001	3,700	Discharge limitations of 7 mg/l DO (min), 400/100 ml fecal coliform (max), and 1 mg/l TRC (max) to comply with water quality standards		19.0
Martin CSO Basin	Lake St. Clair	874 (comb); 7,217 (sanit)	1-year, 1-hour storm (1.0")	Retain entire runoff	8.6
Chapaton CSO Basin	Lake St. Clair	2,424 (comb); 1,865 (sanit)	1-year, 1-hour storm (1.0")	Retain entire runoff	28.0

Note: The total available storage in the DWSD System is 950 MG.

Table 3 summarizes the influent design for the various suburban CSO basins.

Table 3. Suburban CSO Basins – Influent Design

CSO Basin	Basin Size (MG)	Influent – Pumped or Gravity	Installed Pump Capacity (cfs)	Firm Pump Capacity (cfs)
Acacia Park CSO Basin	4.0	Gravity	-	-
Birmingham CSO Basin	5.5	Gravity	-	-
Bloomfield Village CSO Basin	10.0	Gravity	-	-
GWK Drain CSO Basin	62.0	Gravity	-	-
Redford Township CSO Basin	1.7	Pumped	228	190
Inkster CSO Basin	3.0	Pumped	600	500
Dearborn Heights CSO Basin	2.7	Pumped	600	500
Milk River CSO Basin	19.0	Pumped	2,330	1,920
Martin CSO Basin	8.6	Gravity	-	-
Chapaton CSO Basin	28.0	Pumped	1,500	1,000
Total	**144.5**			

Table 4 is a summary of screening facilities at the various suburban CSO basins in the DWSD service area.

Table 4. Suburban CSO Basins – Screening Facilities

CSO Basin	Screen Location	Screen Size (inches)	Disposal of Screenings
Acacia Park CSO Basin	Effluent	¾	Flushed back to the interceptor
Birmingham CSO Basin	Effluent	¾	Flushed back to the interceptor
Bloomfield Village CSO Basin	Effluent	¾	Flushed back to the interceptor
GWK Drain CSO Basin	No influent/effluent screens	-	-
Redford Township CSO Basin	Influent	¾	Conveyed to dumpster for offsite disposal
Inkster CSO Basin	Influent	¾	Conveyed to dumpster for offsite disposal
Dearborn Heights CSO Basin	Influent	¾	Conveyed to dumpster for offsite disposal
Milk River CSO Basin	Influent coarse bar screens	4	Flushed to the sanitary sewer
Martin CSO Basin	No influent/effluent screens	-	-
Chapaton CSO Basin	No influent/effluent screens	-	-

Table 5 summarizes dewatering equipment and dewatering procedures for the suburban CSO basins.

Table 5. Suburban CSO Basins – Dewatering Equipment and Dewatering Operations

CSO Basin	Dewatering Equipment	Dewatering Time (hrs)	Decision to Dewater During an Event
Acacia Park CSO Basin*	2 pumps, each 6.25 cfs (2,800 gpm)	13 hours at 12.5 cfs flow	Dewatered at pre-selected flow unless interceptor is surcharged
Birmingham CSO Basin*	2 pumps, each 7.8 cfs (3,500 gpm)	13 hours at 15.6 cfs flow	Dewatered at pre-selected flow unless interceptor is surcharged
Bloomfield Village CSO Basin*	3 pumps, each 7.8 cfs (3,500 gpm)	24 hours at 15.6 cfs flow	Dewatered at pre-selected flow unless interceptor is surcharged
GWK Drain CSO Basin	Pump station with 90 cfs capacity	24 hours	Dewatered up to contract capacity flow of 260 cfs from the SOCSDS.
Redford Township CSO Basin	By gravity	12-18 hours	Local level sensor in interceptor. Dewatered if interceptor level is below $^{8}/_{10}^{th}$ of diameter.
Inkster CSO Basin	By gravity	12-18 hours	Local level sensor in interceptor. Dewatered if interceptor level is below $^{8}/_{10}^{th}$ of diameter.
Dearborn Heights CSO Basin	By gravity	12-18 hours	Local level sensor in interceptor. Dewatered if interceptor level is below $^{8}/_{10}^{th}$ of diameter.
Milk River CSO Basin	Four 2,500 gpm pumps	24-72 hours	By gravity up to El. 565.0 (in the basin); then pumped
Martin CSO Basin	By gravity	24-72 hours	Dewatering flow based on water elevations in the Jefferson interceptor
Chapaton CSO Basin	By gravity	24-72 hours	Dewatering flow based on water elevations in the Jefferson interceptor

*** - Dewatering times may sometimes exceed 24 hours due to the EFSDS contract capacity restriction.**

9. Dewatered Flows and Solids Loading

Monthly operational records, for a minimum of 12 months, were obtained for the various suburban CSO basins. The operational data was collected within the last six years (since 1995). The data was analyzed to estimate the annual dewatered volume, peak week volume, and peak hour flow for each of the CSO basins. The peak week volume was estimated as the maximum dewatered volume within a 7-consecutive day period.

Table 6 summarizes the dewatering operations data for each of the suburban CSO basins.

Table 6. Suburban CSO Basins – Summary of Dewatered Flows

CSO Basin	Time Period for which Data was Analyzed	Annual Dewatered Volume (MG)	Peak Week Volume (MG)	Peak Hour Flow (MGD)
Acacia Park CSO Basin	7/97-6/99 (23 events)	43.0	7.5	8.1*
Birmingham CSO Basin	7/98-6/99 (7 events)	67.4	24.7	10.1*
Bloomfield Village CSO Basin	8/98-7/99 (24 events)	135.6	26.7	12.1*
GWK Drain CSO Basin	1/99-12/99 (21 events)	953.2	196.9	64.6*
Redford Township CSO Basin	6/97-5/99 (47 events)	26.3	7.6	3.4**
Inkster CSO Basin	6/97-5/99 (85 events)	69.7	14.7	6.0**
Dearborn Heights CSO Basin	9/97-8/99 (34 events)	37.1	13.2	5.4**
Milk River CSO Basin	12/94-11/95 (21 events)	279.2	33.0	19.0**
Martin CSO Basin	8/95-7/96 (13 events)	94.8	9.1	8.6***
Chapaton CSO Basin	8/95-7/96 (11 events)	231.8	56.0	28.0**
Total		**1938 MG**	**389 MG**	**165 MGD**

* - Based on dewatering pump capacity
** - Based on dewatering the basin in 12 hours
*** - Based on dewatering the basin in 24 hours

NOTES:

1. The annual dewatered volume (in MG) and peak week dewatered volume (in MG) are measured values. The peak week dewatered volume was calculated as the maximum dewatered volume within a 7 consecutive day period.
2. The peak hour dewatered flow (in MGD) is not a measured value. It is based either on the dewatering pump capacity or dewatering the basin in 12 or 24 hours, as indicated.

Table 7 presents the solids loading in the dewatered flow for the various suburban CSO basins. The solids loading data was estimated from monthly operational records

using average total suspended solids (TSS) concentrations for the influent and effluent flows measured during each overflow event.
For events where TSS concentrations were not measured, average influent and effluent TSS concentrations of 100 mg/ L and 20 mg/ L, respectively, were assumed.

Table 7. Suburban CSO Basins – Dewatered Flow Estimated Solids Loading

CSO Basin	Annual Solids Load*		Peak Week Solids Load**	
	(lbs)	Avg. TSS (mg/L)	(lbs)	TSS (mg/L)
Acacia Park CSO Basin	54,095	151	13,005	367
Birmingham CSO Basin	48,359	86	13,688	157
Bloomfield Village CSO Basin	114,402	101	40,514	520
GWK Drain CSO Basin	1,035,169	130	233,250	915
Redford CSO Basin	67,268	307	18,678	789
Inkster CSO Basin	100,053	172	21,734	645
Dearborn Heights CSO Basin	50,444	163	23,150	816
Milk River CSO Basin	203,161	87	51,370	550
Martin CSO Basin	502,088	635	77,592	1021
Chapaton CSO Basin	556,882	288	104,026	445
Total	**2,732,000 lbs (1,366 tons)**		**597,000 lbs (298 tons)**	

* Sample Calculation for Acacia Park CSO Basin:
Annual solids load = 54,095 lbs
Annual dewatered volume (from Table 6) = 43.0 MG
Avg. TSS = 54,095 / 43.0 / 8.34 = 151 mg/L

** The peak week solids load is the maximum solids load within a 7-consecutive day period.
The peak week TSS is the maximum TSS averaged over a 7-consecutive day period.

10. Flushing Equipment and Flushing Volumes

The flushing equipment and flushing volumes at the suburban CSO basins are summarized in Table 8. The flushing volume is the volume of flushing water used after a dewatering event.

Table 8. DWSD Suburban CSO Basins – Flushing Equipment and Volume

CSO Basin	Flushing Equipment	Flushing Volume
Acacia Park CSO Basin	12 tipping buckets / potable water	2,450-41,700 gal
Birmingham CSO Basin	13 tipping buckets / potable water	1,200-45,000 gal
Bloomfield Village CSO Basin	23 tipping buckets / potable water	1,200-117,000 gal
GWK Drain CSO Basin	Spray nozzles and a motorized vehicle / potable water	750,000 gal*
Redford Township CSO Basin	8 tipping buckets / potable water	16,000 gal**
Inkster CSO Basin	12 tipping buckets / potable water	24,000 gal**
Dearborn Heights CSO Basin	12 tipping buckets / potable water	18,000 gal**
Milk River CSO Basin	Spray nozzles / from Milk River	160,000-580,000 gal
Martin CSO Basin***	Flushing-resuspension system using pumps / Lake St. Clair	Peak flow of 300 gpm at 200 psi
Chapaton CSO Basin***	Flushing-resuspension system using pumps / potable and canal water	Peak flow of 400 gpm at 130-250 feet head
Total		**0.97 – 1.59 MG**

* Calculated based on 52 banks with 100 nozzles each, with 48 gpm per nozzle for 3 minutes.
** Calculated based on 100 gallons per foot of width per tip
*** The flushing-resuspension system was rarely used during the last six years and flushing volume data was not available.

11. Proposed CSO Control Facilities

Wayne County

Three of the Wayne County communities, Dearborn Heights, Inkster and Redford Township, developed their CSO control programs in two phases. The constructed CSO basins in each community were Phase I of each control program. The three communities have begun planning efforts for their Phase II control programs, and have submitted Draft Basis of Design reports to the MDEQ. The Basis of Design reports evaluated the various available alternatives and have outlined the recommended alternative for each community. A summary of the recommended Phase II alternative for each communities is provided below.

Currently, the City of Dearborn does not have any CSO control facilities. However, the City of Dearborn developed and presented its CSO control program Basis of Design Report to the MDEQ in October 2000. A summary of Dearborn's CSO control program is also presented below.

This report was written prior to the decision to abandon the regional capture tunnel between the cities of Detroit and Dearborn. Both cities are currently planning their own tunnels for CSO storage. This report makes some recommendations based upon the construction of the joint tunnel alternative. These recommendations should be re-evaluated based on their applicability to the separate tunnel alternative.

Redford Township

Redford Township has eleven CSO outfalls; the existing CSO basin controls three outfalls. The remaining eight CSO outfalls will be controlled as part of the Phase II control program.

A Storm Water Management Model (SWMM) was developed to predict wet weather peak flows from each CSO tributary area. The 10-year, 1-hour design storm event (1.80 inches) was used to determine the peak flows and volumes within each CSO tributary area. A Draft Basis of Design Report (Alternative Evaluation Report) was prepared by Redford Township and presented to the MDEQ in May 2001. The following information related to Redford Township's Phase II CSO control program is derived from the above report.

Table 9 summarizes the peak flows and volumes resulting from the 10-year, 1-hour storm. A contact time of 20 minutes was used to size the proposed facility volume.

Table 9. Peak Flows and Volumes for the Redford Township Phase II CSO Areas

CSO Outfall Number	Peak Flow in cfs Resulting from the 10-year, 1-hour Storm (1.80 in)	Volume in MG Based on 20 Minutes Contact Time
39	30.4	0.27
40	9.7	0.09
41	11.2	0.10
42	22.0	0.20
43	7.3	0.07
44	13.9	0.12
	Subtotal	**0.85 MG**
45	96.0	0.86
45A	139.8	1.25
	Subtotal	**2.12 MG**

Based on the above peak flows and volumes, the Alternative Evaluation Report evaluated three alternatives. The first alternative looked at sewer separation within the existing combined collection system. The second alternative involved construction of two new CSO basins with volumes as described in Table 9. The third alternative was the regional alternative and examined routing the eight CSO areas in Redford Township to a proposed CSO Tunnel in the City of Detroit. The regional tunnel alternative was determined to be the best alternative. At the time of this report, discussions were ongoing between Redford Township, City of Detroit (DWSD) and MDEQ.

City of Inkster

The City of Inkster developed and presented a Draft Basis of Design Report (Alternative Evaluation Report) for Phase II of its CSO control program to MDEQ in June 2001.

The City of Inkster has a total of eighteen CSO outfalls. The existing CSO basin controls ten of these outfalls. The remaining eight CSO outfalls will be controlled as part of the Phase II CSO control program. In addition, an internal overflow at Princess and Carlysle Avenue was also considered. The NPDES permit for three of these uncontrolled CSO outfalls (L-41, L-43 and 011) is shared with the City of Dearborn Heights. The nine uncontrolled CSO outfalls were divided into the western and eastern outfalls. Outfall L-42 from the City of Dearborn Heights was also considered since its flow co-mingles with flows from the eastern outfalls.

SWMM was used to model the flow from the various CSO districts within the City of Inkster. The 10-year, 1-hour storm event was used to estimate the peak flows and facility volumes for each CSO area. A 10-minute contact time for the peak flow resulting from the 10-year, 1-hour storm (1.80 inches) was used to calculate the facility volumes. Table 10 summarizes the peak flows and volumes for the City of Inkster's Phase II CSO control program.

Table 10. Summary of Peak Flows and Volumes for Inkster's Phase II CSO Control Program

	CSO Outfall No.	Peak Flow in cfs Resulting from the 10-Year, 1-Hour Storm (1.80 in)	Volume in MG Based on 10 Minutes Contact Time
Western Outfalls	L-49	17.2	0.08
	L-46	139.5	0.63
	009	232.4	1.04
	004-008	N/ A	N/ A
Eastern Outfalls	L-42	111.0	0.50
	L43	39.0	0.18
	Princess & Carlysle	45.3	0.20
	010	29.3	0.13
	011	112.5	0.50
	L-41	63.3	0.28
	L-41 Total	250.4	1.12

Based on the above peak flows and volumes, eight alternatives were developed. The eight alternatives were regulator adjustments, sewer separation, maximizing existing CSO basin and basin expansion, new CSO basins, conventional CSO tunnel, regional alternative, swirl concentrator, and a flow-through tunnel.

For outfalls L-46 and 009, maximizing the existing CSO basin without Outfall L-39 was ranked as the best alternative. For outfalls L-49 and 004-008, the sewer separation alternative was chosen as the selected alternative. For the eastern outfalls, the regional alternative was ranked as the best alternative. The final selection of the alternatives was planned to occur after the regional alternative had been further developed by the MDEQ, City of Detroit and City of Dearborn. The Rouge Program Office (RPO) will perform an in-stream water quality assessment of these alternatives to determine if they are likely to meet the water quality (Phase III) objectives.

City of Dearborn Heights

The City of Dearborn Heights submitted a Draft Basis of Design Report (Alternative Evaluation Report) for the Phase II CSO control program to MDEQ in May 2001.

The City of Dearborn Heights has fourteen CSO outfalls. Ten of these outfalls are in the northern end of the city and are referred to as the Middle Rouge River Outfalls. The other four outfalls are located along the Beech Daly corridor and are referred to as the Lower Rouge River Outfalls. The existing CSO basin controls four outfalls. The remaining ten outfalls will be controlled during the Phase II CSO control program. The NPDES permit for three outfalls is shared with the City of Inkster.

SWMM was used to model all of the CSO districts within the City of Dearborn Heights. The 10-year, 1-hour storm was used to predict the peak flows from each CSO area.
A 10-minute contact time was used to determine the facility volume required for each CSO area. Table 11 summarizes the design peak flows and volumes for the City of Dearborn Heights Phase II CSO control program.

Table 11. Peak Flows and Volumes for Dearborn Heights Phase II CSO Control Program

	CSO Outfall No.	Peak Flow in cfs Resulting from the 10-Year, 1-Hour Storm (1.80 in)	Volume in MG Based on 10 Minutes Contact Time
Middle Rouge River Outfalls	M-13	20.0	0.09
	M-14	50.0	0.22
	M-18 & 3A	203.0	0.91
	M-19	41.0	0.18
	U-1	40.0	0.18
Lower Rouge River Outfalls	L-42	111.0	0.50
	L-43	39.0	0.18
	L-41 Total	250.4	1.12

Based on the peak flows and volumes, eight alternatives were developed. The eight alternatives were regulator adjustments, sewer separation, maximizing existing CSO basin and basin expansion, new CSO basin, conventional CSO tunnel, regional alternative, swirl concentrator, and a flow-through tunnel.

For the Middle Rouge River Outfalls, two alternatives were approximately the same and were ranked the highest. The first alternative would require construction of new collector sewers to convey CSO flow from all the Middle Rouge outfalls to the existing CSO basin, and increasing the pumping capacity of the existing pump station from 500 to 550 cfs. The second alternative would require construction of collection sewers to convey CSO flow from all Middle Rouge outfalls except U-1 to the existing CSO basin, a collector sewer to convey CSO flow from Outfall U-1 to the proposed Detroit Tunnel, and increasing the pumping capacity of the pump station from 500 to 550 cfs.

For the Lower Rouge River Outfalls, the regional alternative and the new CSO basin alternative were ranked highest and next highest, respectively. Negotiations were ongoing between the MDEQ, City of Detroit and City of Dearborn on the regional alternatives. The final selection of alternatives for the Middle Rouge and Lower Rouge outfalls will be made after the regional alternatives have been further developed. The RPO will perform an in-stream water quality assessment of these alternatives to determine if they are likely to meet the water quality (Phase III) objectives.

City of Dearborn
The City of Dearborn submitted its Basis of Design Report for the Dearborn CSO Control Program to MDEQ in October 2000.

The Basis of Design report presented the recommended alternative for controlling CSO discharges to the Rouge River from Outfalls 001 through 015, and Outfall 020 in the East and West Dearborn sewer districts.

Phase A (formerly, Phase I) will eliminate CSO discharges from Outfalls 013, 014 and 015.
Phase B (formerly, Phase II) will eliminate CSO discharges from Outfalls 001 through 012, and 020. The City of Dearborn has plans to separate the sewers tributary to Outfall 019.
Outfalls 016, 017 and 021 will be addressed separately and will be included in the Phase B Basis of Design Report. Outfall 023 will be controlled after all outfalls upstream of it are controlled during Phases A and B.

In the early 1990s, various alternatives were considered by the City of Dearborn to eliminate CSO discharges to the Rouge River. As a result, construction of an 18-foot diameter rock tunnel was started in 1994 to control discharges from Phase A outfalls. However, construction was halted in 1995 as the Contractor encountered large quantities of groundwater containing hydrogen sulfide. Subsequently, the City of Dearborn entered into a new Administrative Consent Order (ACO) with the Michigan Department of Environmental Quality (MDEQ), which extended the schedule for the construction of the City of Dearborn CSO control program. The new ACO calls for Phase A construction to be completed by January 1, 2004 and Phase B construction to be completed by January 1, 2008.

In April 1999, a consulting firm was hired by the City of Dearborn to assist in selecting a cost-effective CSO control program for Phases A and B, and to design Phase A of the control program. After identifying the hydraulically feasible alternatives, six principal alternatives were recommended and are presented below in Table 12.

Table 12. Six Principal Alternatives for Dearborn Phase A CSO Control Program

Alternative Designation	Facility Description	Total Storage (MG)	Cost in Million $[(1)]
A	Large basins with collector sewers	49.4	295 / 2.7
B	Small basins with collector sewers	35.8	246 / 2.5
C	17-foot diameter flow-through tunnel	59.6	288 / 2.1
D	14-foot diameter flow-through tunnel	43.2	268 / 2.1
E	11-foot capture tunnel / large treatment shafts	48.9	310 / 3.3
F	8-foot capture tunnel / large treatment shafts	38.9	290 / 3.3

(1) Capital cost / O&M cost in Year 2000 dollars

Based on the evaluations, the 17-foot diameter flow-through tunnel (Alternative C) was selected.

Phase A consists of a 13,180-foot long tunnel that would receive overflows from three drop shafts serving Outfalls 013, 014 and 015. During the flow-through conditions, the flow would be disinfected at two locations in the tunnel providing 10 minutes of contact time and would be pumped to the Rouge River through a downstream pumping station located at the existing Greenfield Pumping Station site. The total capacity of the proposed pump station is 2,524 cfs. A screening facility located downstream of the pumping station would screen the flow before it is discharged to the Rouge River.

In November 2000, the Cities of Dearborn and Detroit, and the MDEQ first discussed the concept of a regional CSO tunnel facility. Based on the Basis of Design Report for a combined regional capture tunnel between the Cities of Detroit and Dearborn, the combined regional tunnel would have a total capacity of 210 MG (120 MG for Detroit, 60 MG for Dearborn, and 30 MG for the connection). The construction of the regional capture tunnel was expected to reduce the average overflow frequency from approximately 60 overflows per year to approximately 0.8 overflows per year. The average annual CSO discharge volume was expected to decrease from 1680 MG to 230 MG (86 percent reduction).

The scope for evaluating the regional capture tunnel alternative is currently being developed through discussions between the MDEQ, and the cities of Detroit and Dearborn.

Oakland County

GWK Drain RTF

The Retention Treatment Facility (RTF) for the GWK Drainage District (formerly, Twelve Towns Drainage District) of the Southeastern Oakland County Sewage Disposal System (SOCSDS) is authorized to discharge treated CSO to the Red Run Drain (a tributary of the Clinton River), through a NPDES Permit.

In 1996, the MDEQ re-issued the NPDES permit for the Twelve Towns RTF with new, more stringent requirements. Several parties contested the permit. Subsequent negotiations led to a settlement permit, issued in October 1998, which requires implementation of RTF improvements.

The improvements are to provide a cost-effective, socially acceptable, and environmentally sound program to reduce the number and volume of overflows and to meet the MDEQ's presumptive criteria for adequate CSO control. MDEQ defines its presumptive "adequate treatment" criteria as total capture of the 1-year, 1-hour storm event and 30 minutes detention (for settling, skimming, and disinfection) of the 10-year, 1-hour storm event.

The major recommended improvements include the following:

1. The existing weir wall to be lowered 2 feet and increasing the weir length to a total of approximately 473 feet.

2. Construction of a new 2000 ft inlet weir structure downstream from the existing inlet structure. The new inlet weir structure will add 30.7 MG storage, and results in increasing the volume upstream of the RTF from 32 to 64.9 MG (32.9 MG increase) and reducing the RTF storage volume from 62 to 56.9 MG. The total system storage will increase from 94 to 121.8 MG (overall increase of 27.8 MG).
3. Construction of a new dewatering pumping station with force main discharging to the Twelve Mile Road Interceptor. This will enable the system to achieve its DWSD contractual limit of 260 cfs early in a storm event, thus increasing the effectiveness of the GWK Drain System storage.
4. New disinfection system including construction of sodium hypochlorite storage building.
5. Fine screens system for the new proposed weir ("intermediate" weir).
6. An automatic flushing system to convey the screened and settled solids in the new storage chambers to the proposed dewatering pumping station.
7. Eliminate the Madison Heights separate storm sewer inputs from the RTF by constructing new parallel storm sewers to convey the Madison Heights storm water directly to the Red Run Drain.
8. Eliminate the Madison Heights CSO inputs from the RTF by re-routing them upstream of the new inlet weir structure to the new dewatering pumping station.
9. Eliminate the Hazel Park sanitary discharges to the RTF by routing them to the Dequindre Road Interceptor.

The design of Contract 4, which includes all of items 1 through 6, and parts of items 7 and 8, is complete, and the construction contract has been awarded. Construction was scheduled to begin in October 2001, and will last about four years. Construction for the remaining portions of items 7 and 8, and item 9 were scheduled to be completed in late 2001 under a separate contract.

Acacia Park, Birmingham and Bloomfield Village CSO RTBs

The above three CSO RTBs were designed for unrestricted flow coming into the basins. However, the sewers in the drainage areas tributary to the Birmingham and Bloomfield Village CSO RTBs are restrictive. Hence, the two communities have an on-going program to build relief sewers to provide unrestricted flow within their sewer system.

The addition of these relief sewers will result in unrestricted flow in areas tributary to the Birmingham and Bloomfield Village CSO RTBs, and may result in these RTBs being filled more frequently than before.

Macomb County

The City of Warren has a separate sewer system and its own wastewater treatment plant, and is located in the Clinton River watershed. The sanitary system is considered a wet system due to some inflow and infiltration.

Recently, the City of Warren commissioned a study to formulate alternatives and to develop short-term and long-term strategies to control the wet weather flow component in the eastern half of the city. The Draft Study Report – City of Warren Sanitary Sewer Review Assessment and Improvement Development Program, East Trunk Sewer System, Volume I – was submitted in July 2001.

The report recommended sewer system improvements by installing overflow chambers to the existing DWSD interceptor at three locations, as well as other improvements. The proposed maximum flow from the City of Warren to the DWSD interceptor, under certain wet weather conditions, is expected to be 27 MGD (42 cfs). At the time of this report, no agreement, in any form, had been reached.

12. Summary

Existing CSO Control Facilities

Currently, there are ten combined sewer overflow retention treatment basins located in suburban communities that dewater to the DWSD collection system.
Of these ten CSO basins, four are located in Oakland County (Acacia Park CSO RTB, Birmingham CSO RTB, Bloomfield Village CSO RTB and GWK Drain CSO RTF), four are located in Wayne County (Dearborn Heights CSO basin, Inkster CSO basin, Redford Township CSO basin and Milk River CSO basin), and two are located in Macomb County (Martin CSO RTB and Chapaton RTB).

The existing CSO basins vary in size from 1.7 million gallons (Redford Township) to 62.0 million gallons (GWK Drain). The total capacity of the ten CSO basins is 144.5 million gallons. Most of these CSO basins were designed for the 1-year, 1-hour storm while others were designed for the 10-year, 1-hour storm (except for Milk River CSO basin, which was designed to meet certain water quality standards). Some of the CSO basins have been designed for a 10, 20 or 30 minute contact time, while other basins have been designed to capture the entire runoff.

The Oakland County CSO basins have no influent pumps and screening is provided at the effluent end. The Wayne County CSO basins have influent screens and pumps. The two Macomb County CSO basins have no screens with one of the basins with influent pumping.

The Oakland County CSO basins are dewatered using dewatering pumps, and the basins have been designed to dewater within a 24-hour period. During some events, the CSO basins may be dewatered over a period greater than 24 hours due to contract capacity restrictions. The three western Wayne County basins are dewatered by gravity within 12 to 18 hours, while the Milk River CSO basin is initially dewatered by gravity and then pumped, and is dewatered within 72 hours. The Macomb County CSO basins are dewatered by gravity within 72 hours.

Monthly operational records for the existing CSO basins were obtained for a minimum of 12 months.

The annual dewatered volumes for the ten basins varied from 26.3 MG for the Redford Township CSO basin to 953.2 MG for the GWK Drain CSO basin. The total annual dewatered volume for the ten CSO basins was approximately 1,938 MG. The peak week volume varied from 7.5 MG to 196.9 MG, with a total peak week volume of 389 MG. The annual solids load in the dewatered flow varied from 48,400 lbs (for Birmingham CSO basin) to 1,035,000 lbs (for GWK Drain CSO basin). The estimated total annual solids loading from the ten CSO basins was 1,366 tons (2,732,000 lbs). The peak week solids load varied from 13,000 lbs to 233,250 lbs, with a total peak solids load of 298 tons (597,000 lbs).

Six of the ten CSO basins use tipping buckets for flushing. The GWK Drain CSO basin and the Milk River CSO basin use spray nozzles. The two Macomb County CSO basins, Martin CSO RTB and Chapaton CSO RTB, use a re-suspension flushing system. The flushing volumes for the ten CSO basins vary from 1,200 gallons to 750,000 gallons per dewatering event.

Proposed CSO Control Facilities

Within Wayne County, the communities of Redford Township, Dearborn Heights and Inkster have submitted the Basis of Design reports for Phase II of their CSO control programs.
This will result in all CSO outfalls to be controlled in these communities. The City of Dearborn currently has no CSO control facilities, but has submitted a Basis of Design report to the MDEQ for a 17-foot diameter flow-through tunnel. The City of Dearborn was also discussing a regional CSO tunnel concept with the MDEQ and the City of Detroit (DWSD).

In Oakland County, the design for improvements to the GWK Drain CSO RTB has been completed and the construction contract has been awarded. The improvements contract will increase the GWK Drain CSO RTB total storage volume from 94 to 121.8 MG. The contract will also lower the weir wall by 2 feet, add a new 100 cfs dewatering pump station, add a new disinfection system, and eliminate combined sewer and storm sewer flows that currently enter the RTB at intermediate points. Relief sewers are being constructed in areas tributary to the Birmingham CSO RTB and Bloomfield Village CSO RTB.

In Macomb County, the City of Warren is evaluating the option of installing three overflow chambers to the DWSD interceptor. The expected maximum flow from the City of Warren to the DWSD collection is 27 MGD (42 cfs).

13. References

1. Combined Sewer Overflow (CSO) Control Policy, Final Policy, 40 CFR Part 122, U.S. Environmental Protection Agency, April 1994.

2. Michigan Combined Sewer Overflow Control Program Manual, Michigan Department of Environmental Quality, September 1994.

3. CSO Basin Evaluation Report – Interim Final, Dearborn Heights CSO Detention Basin, City of Dearborn Heights, March 2000, Prepared by Wade-Trim/ Associates, Inc.

4. CSO Basin Evaluation Report – Interim Final, Inkster Detention Basin, City of Inkster, March 2000, Prepared by Wade-Trim/ Associates, Inc.

5. ICDB Milk River Retention Basin – Project Performance Certification, April 1996, Rev. November 1998, Prepared by Tetra Tech MPS (formerly, McNamee, Porter and Seeley, Inc.)

6. CSO Basin Evaluation Report – Interim Final, Township of Redford Detention Basin, Charter Township of Redford, March 2000, Prepared by Wade-Trim/ Associates, Inc.

7. Retention Basin Evaluation for the Acacia Park CSO RTB, Acacia Park CSO Drainage Board, March 2000, Prepared by Hubbell, Roth and Clark, Inc.

8. Retention Basin Evaluation for the Birmingham CSO RTB, Birmingham CSO Drainage Board, March 2000, Prepared by Hubbell, Roth and Clark, Inc.

9. Retention Basin Evaluation for the Bloomfield Village CSO RTB, Bloomfield Village CSO Drainage Board, March 2000, Prepared by Hubbell, Roth and Clark, Inc.

10. Final Project Plan, George W. Kuhn Drain (Twelve Towns CSO Control Program), Volume 1, June 1999, Prepared by Hubbell, Roth and Clark, Inc.

11. South Macomb Sanitary District – Overflow Study and Improvement Plan, South Macomb Sanitary District and Macomb County Office of Public Works, December 1996, Prepared by McNamee, Porter and Seeley, Inc. and Spalding, DeDecker and Associates, Inc.

12. Basis of Design Report (Alternative Evaluation Report), City of Dearborn Heights Phase II Combined Sewer Overflow Control Project, City of Dearborn Heights, May 2001, Prepared by Wade-Trim/ Associates, Inc. in association with Applied Science, Inc. and Sigma Associates, Inc.

13. Basis of Design Report (Alternative Evaluation Report), City of Inkster Phase II Combined Sewer Overflow Control Project, City of Inkster, June 2001, Prepared by Wade-Trim/ Associates, Inc. in association with Applied Science, Inc.

14. Basis of Design Report (Alternative Evaluation Report), Redford Township Phase II Combined Sewer Overflow Control Project, Redford Township, May 2001, Prepared by Wade-Trim/ Associates, Inc. in association with Applied Science, Inc.

15. Basis of Design Report - City of Dearborn, Michigan, Dearborn CSO Control Program, October 2000, Prepared by the NTH Team.

16. Basis of Design Report – George W. Kuhn Drainage District Retention Treatment Facility Improvements, April 2001, Prepared by the GWK Drain Team.

17. City of Warren – Sanitary Sewer Review Assessment and Improvement Program, East Trunk Sewer System, Study Report, Volume I, July 2001.